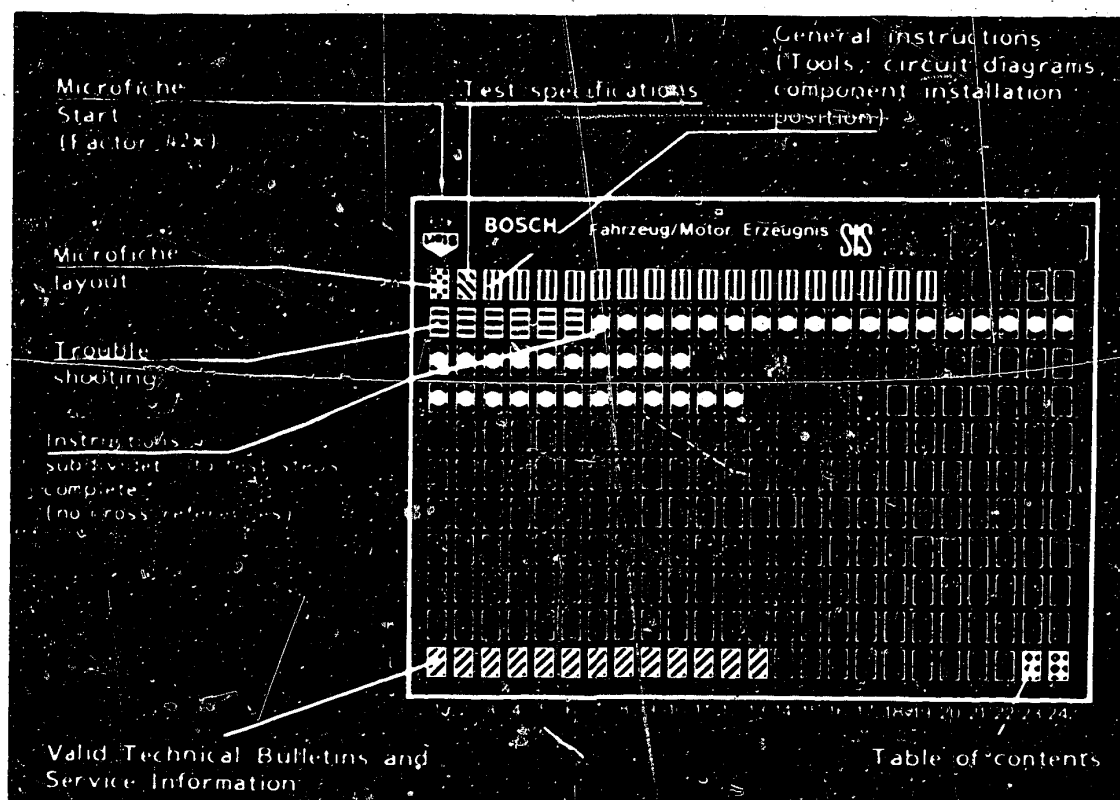


## Structure of microfiche

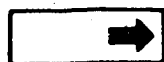


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

<b>E 16</b>	Product/assembly/test step	
	Vehicle/engine	

Coordinate

### 3. Limits of section



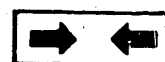
Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

**C 6**

**A1**

Trouble-shooting program



## 1. Test Specifications

Ignition coil, primary	0.7 ... 1.2
Ignition coil, secondary	6.9 ... 11.9 k

**B9**

Basic ignition timing at idle speed (without vacuum)	6° BTDC 800 - 900 min <sup>-1</sup>
--	--

**B15**

Control voltage Throttle-valve switch	2.8 V
--	-------

**B21**

Part-load spark advance, cold at 3000 min <sup>-1</sup> (without vacuum)	16 - 19° BTDC
Part-load spark advance, warm at 3000 min <sup>-1</sup> (without vacuum)	25 - 28° BTDC

**C5**

Voltage supply Trigger box	12 ... 14 V
Voltage supply Ignition coil	10 V

**C7**

Primary voltage at idle	295 ... 365 V
-------------------------	---------------

**C9**

Voltage supply Ignition pulse generator	6 V
--	-----

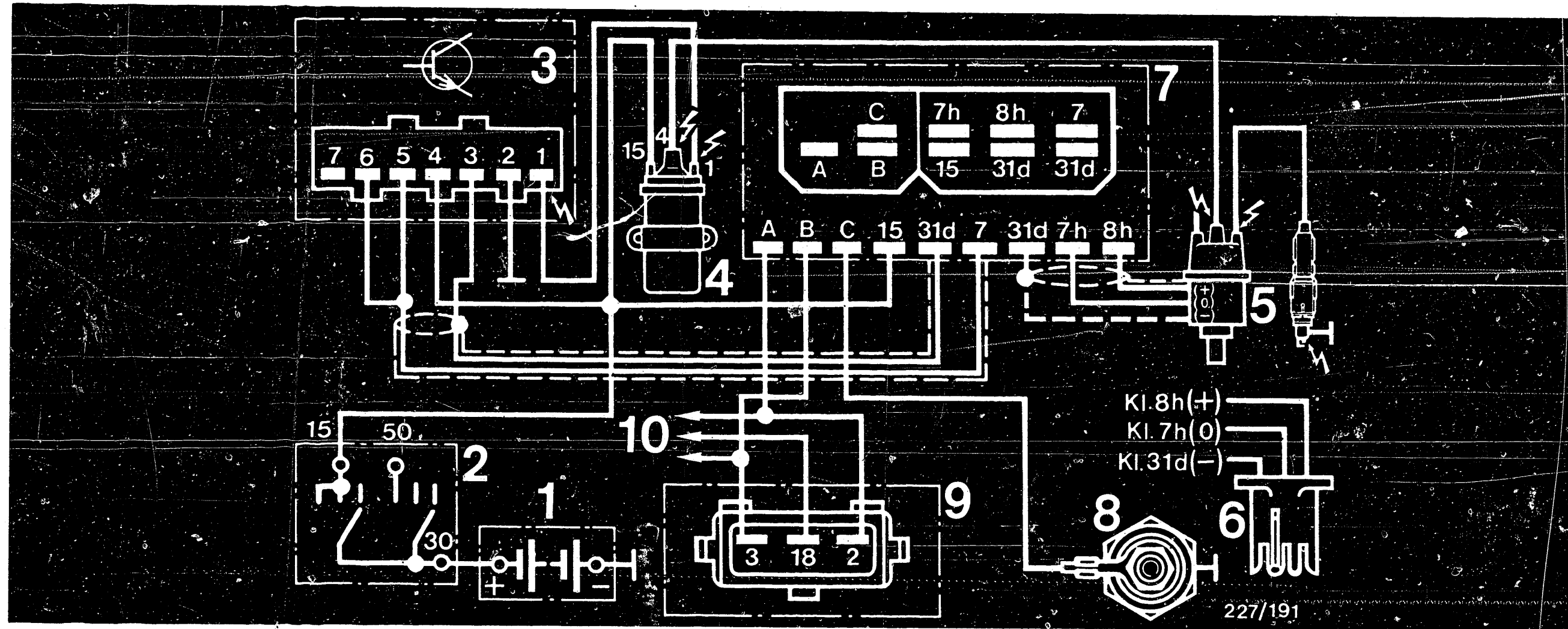
**D4**

See Autodata test specifications for settings for ignition, idle speed, exhaust gas, valve clearance etc.

**A2**Test specifications

Alfa Romeo





⚡ = dangerous voltages (400 V - 25 kV)

## 2. Electrical Terminal Diagram

1 = Battery

2 = Ignition and starting switch

3 = Trigger box

4 = Ignition coil

5 = Ignition distributor

6 = Ignition-distributor connector

7 = Ignition timing unit

8 = Thermo-switch

9 = Throttle-valve switch

10 = to L-Jetronic

**A3**

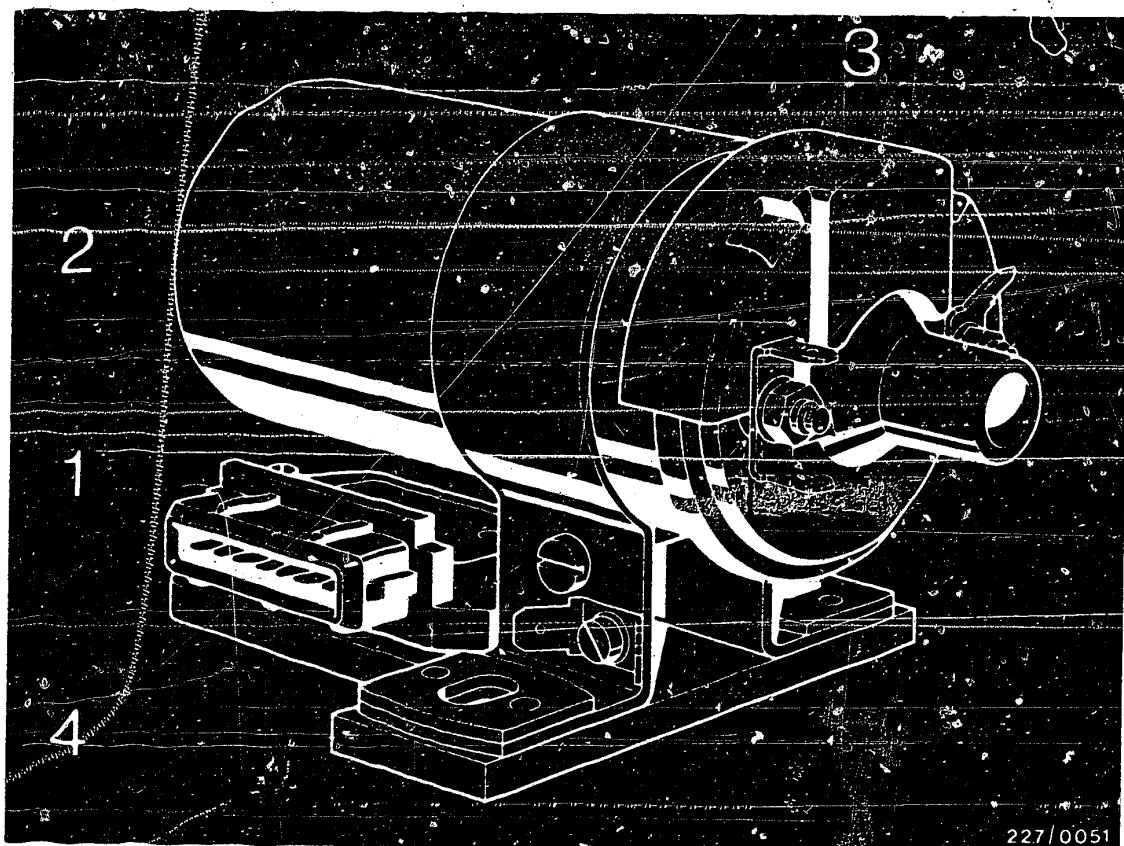
Electrical Terminal Diagram  
Alfa Romeo



**A4**

Electrical Terminal Diagram  
Alfa Romeo





227/0051

1 = TI-I trigger box  
2 = Ignition coil

3 = Protective cap  
4 = Heat sink

### 3. Installation position of components

The trigger box and the ignition coil are mounted on a common heat sink and are housed in the engine compartment.

**A5**

Installation position of components

Alfa Romeo





The ignition timing unit (see top picture) is on the left-hand side under the instrument panel.

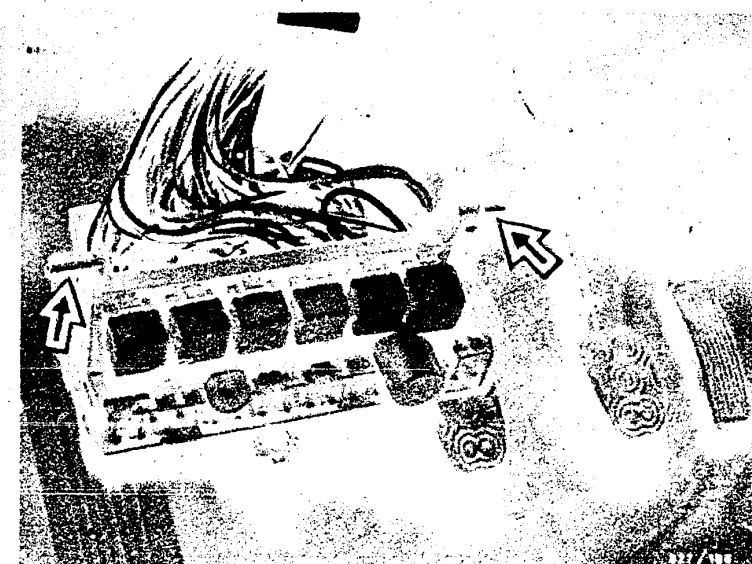
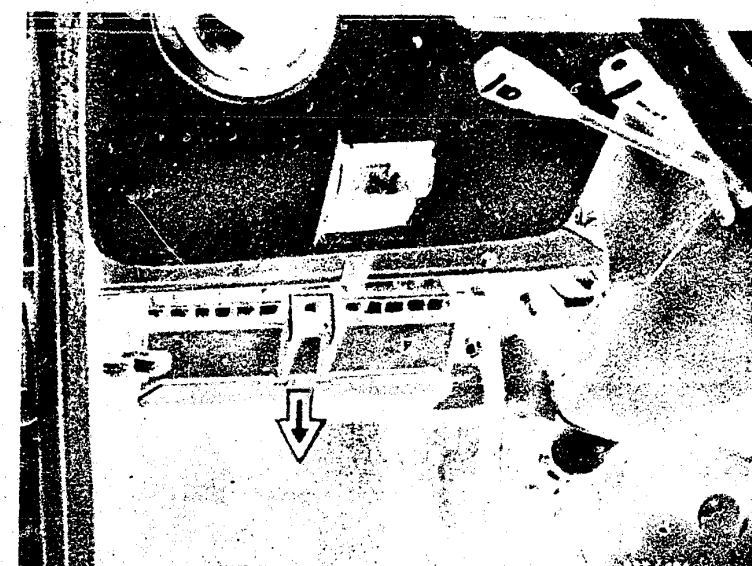
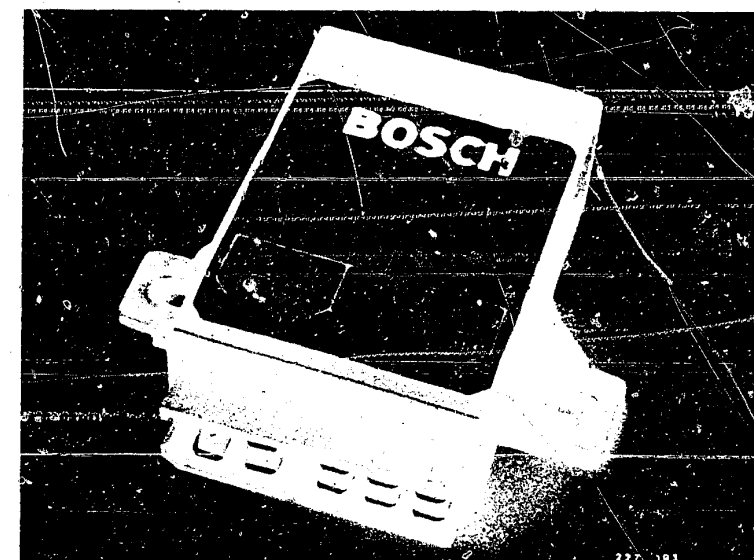
Instructions for removal:

Pull the handle of the central-electrics console downward. See arrow in centre picture.

Force the central-electrics console out of the swivel bearing on the left-hand side. See arrow, bottom picture.

Pull the central-electrics console out of the right-hand swivel bearing. See arrow, bottom picture.

The connector and fastening screws of the ignition timing unit are now easily accessible.



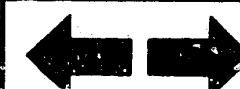
**A6**

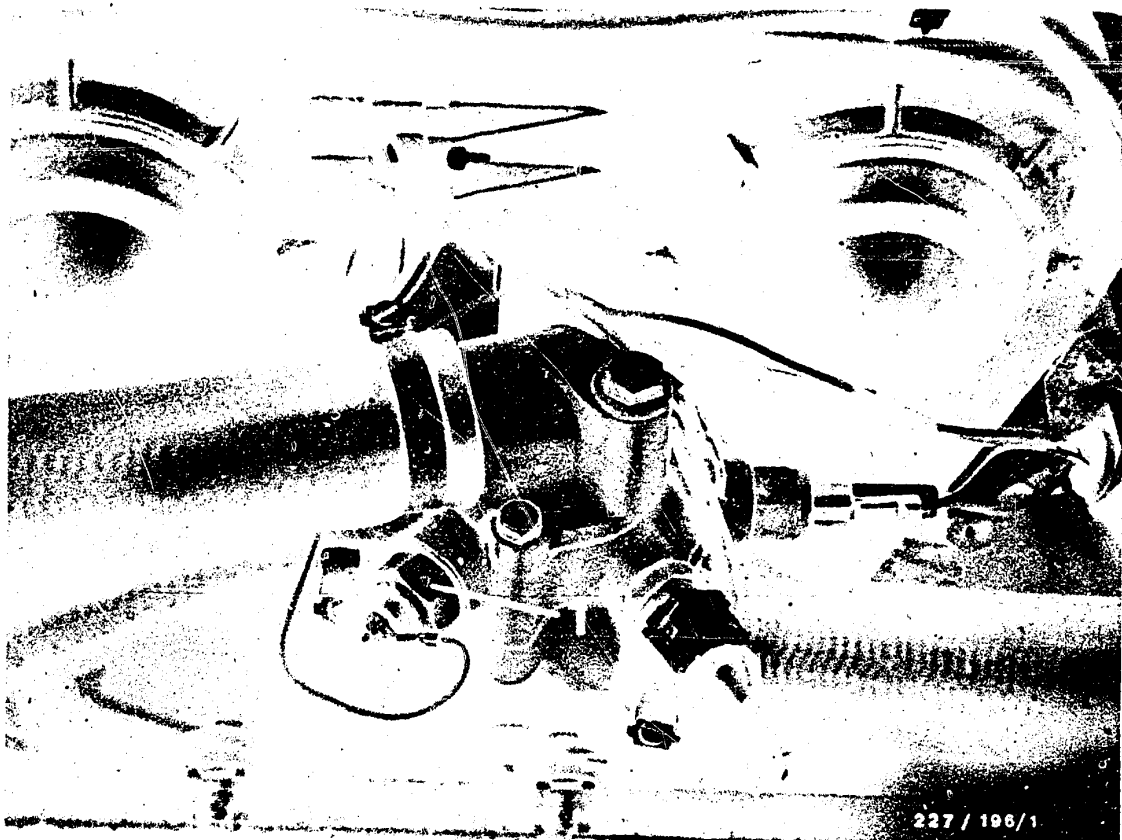
Installation position of components  
Alfa Romeo



**A7**

Installation position of components  
Alfa Romeo





1 = Thermo-switch

The thermo-switch is mounted on the engine at the front.  
See picture.

**A8**

Installation position of components  
Alfa Romeo





1 = Throttle-valve switch

The throttle-valve switch is mounted on the engine on the right-hand side in the forward direction of travel. See picture.

**A9**

Installation position of components  
Alfa Romeo





The battery is in the luggage compartment (left-hand side).

Fold back the carpet and remove battery cover.

**A10**

Installation position of components  
Alfa Romeo



#### 4. Necessary test equipment, aids

Motortester e. g.	MOT 201	0 684 000 201
Spark gap e. g. ignition coil and condenser tester or single spark gap	EFAW 106 A EF 1177/7	0 681 100 001 1 684 531 000
5 kV sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontavi Wh2	commercially available
Voltmeter e. g.	ETE 014.00	0 684 101 400
Thermal conduction paste		5 942 860 003
Test prods		commercially available



## 5. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).



If, while testing the ignition system or during adjustment work on the engine (e. g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

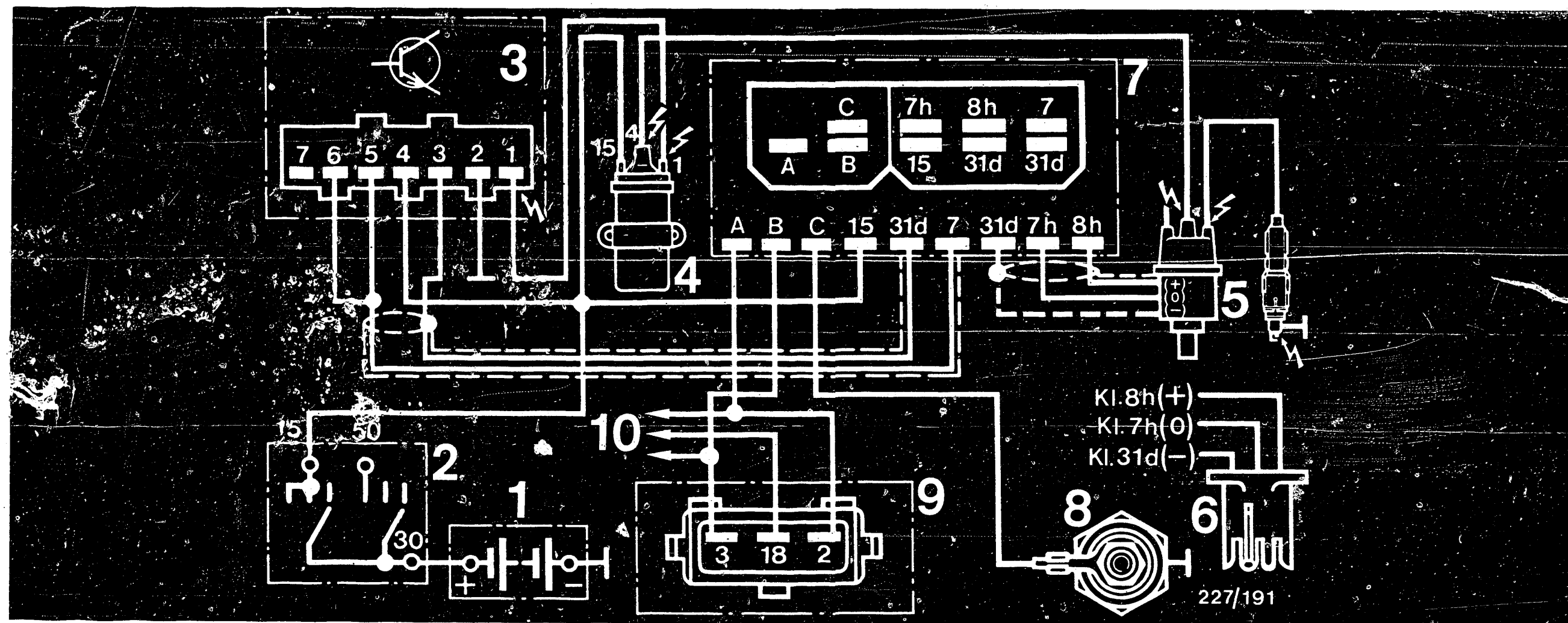
The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.

**A13**

Danger of accident

Alfa Romeo





⚡ = dangerous voltages (400 V - 25 kV)

- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition coil
- 5 = Ignition distributor

- 6 = Ignition-distributor connector
- 7 = Ignition timing unit
- 8 = Thermo-switch
- 9 = Throttle-valve switch
- 10 = to L-Jetronic

### Electrical terminal diagram

The dangerous locations are marked with danger arrows taking the example of the terminal diagram of an electronic ignition system.

**A14**

Danger of accident  
Alfa Romeo



**A15**

Danger of accident  
Alfa Romeo





6. Incorrect indication of engine speed, dwell angle  
and ignition point

In ignition systems with trigger box 0 227 100 111 (TI-i) with current limitation there may be an incorrect indication of engine speed, dwell angle and ignition point on testers.

For further details see coordinates L 8 - L 12.



## 7. Important vehicle information

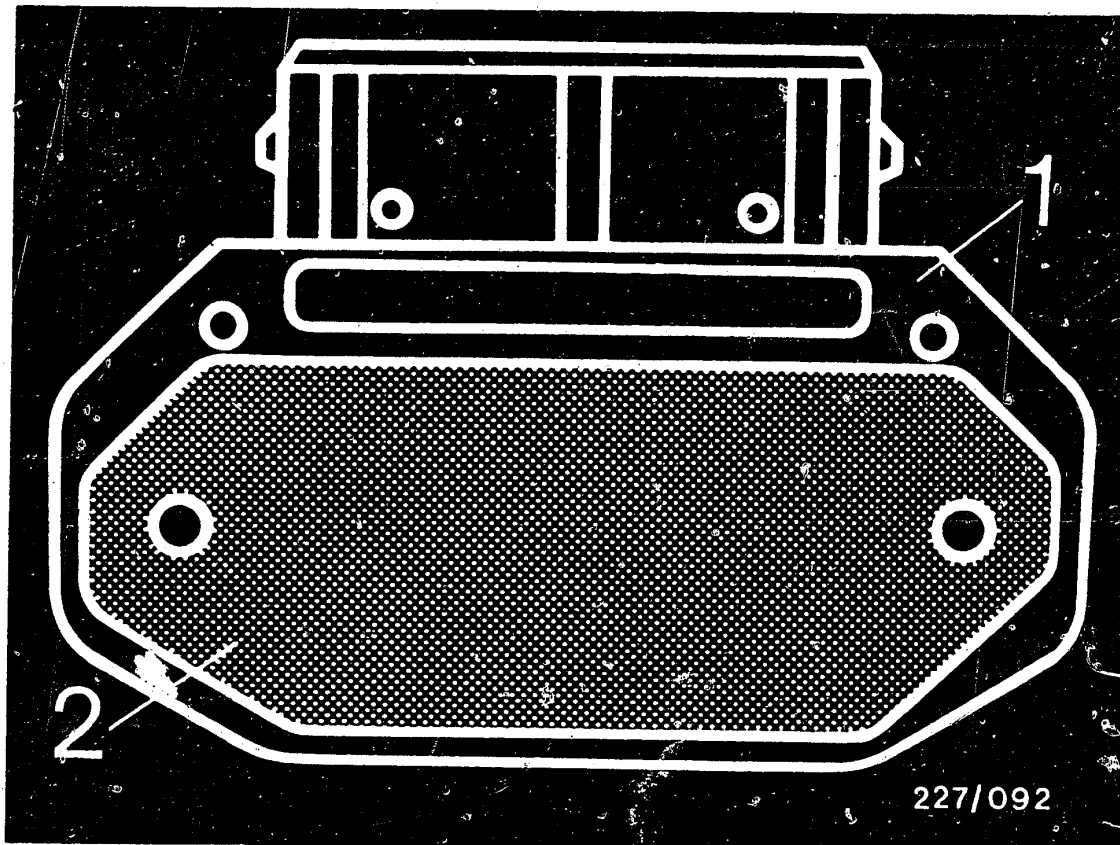
- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- During the compression test, either pull off the trigger-box plug or f i r m l y connect terminal 4 of the ignition coil to ground using an extra cable (dangerous voltages, insulation damage at ignition coil, ignition distributor, ignition harness).

### Note:

The extra cable must be suppressed with at least 2 k  $\Omega$ , e. g. with sleeve-type suppressor (5 k  $\Omega$ ) 0 356 500 001.

- The specified ignition coil (see Part No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1 and terminal 15.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (trigger box will be destroyed).
- Ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15. The magnetic pick-up assembly and trigger box may be destroyed.



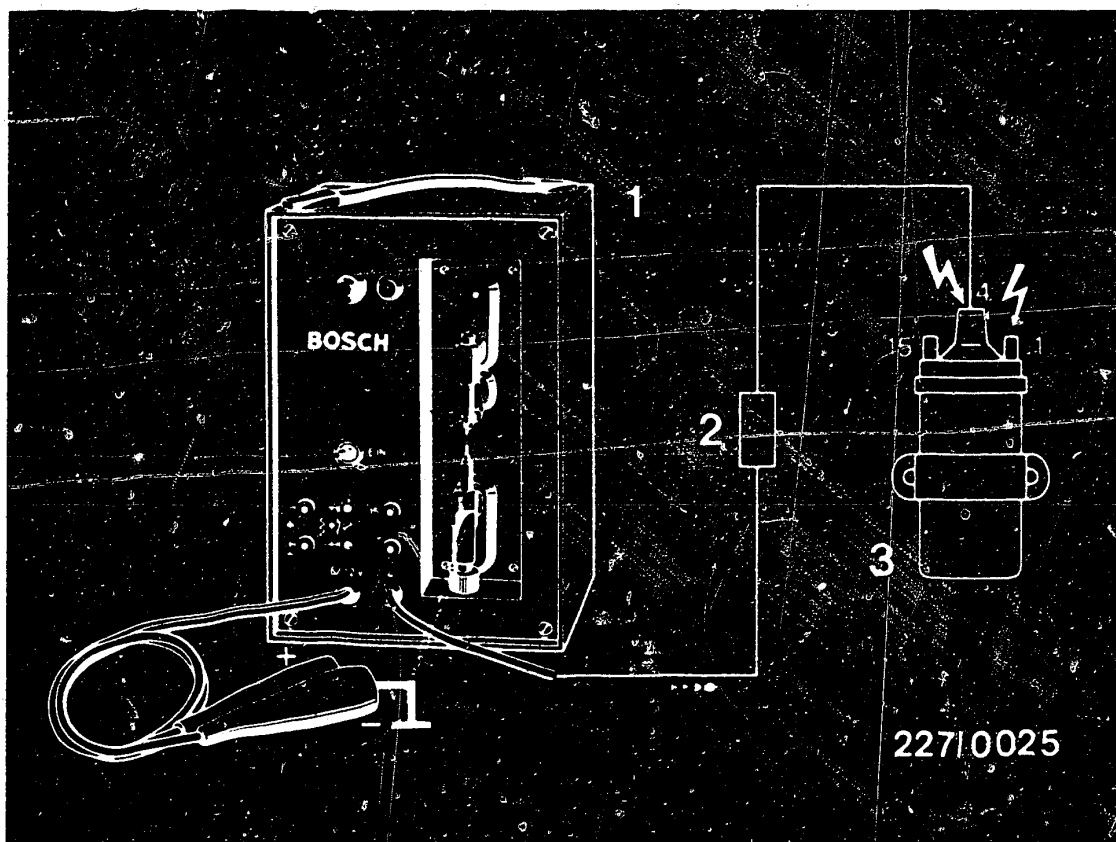


1 = Trigger box


2 = Base plate

- Before mounting the trigger box, the base plate must be coated with thermal conduction paste. Apply thermal conduction paste only with a suitable object (screwdriver, matchstick etc.)

Do not apply thermal conduction paste to painted parts.



- 1 = Spark gap
- 2 = 5 kΩ sleeve-type suppressor
- 3 = Ignition coil

 = dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 2 kΩ must be connected between the spark gap and ignition coil terminal 4, e. g. sleeve-type suppressor (5 kΩ.)  
0 356 500 001.

**A19**

Important vehicle information  
Alfa Romeo



- In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 2 k  $\Omega$  interference suppression whereby the original distributor rotor with 1 k  $\Omega$  interference-suppression resistor must be fitted (even in the case of radio and spark interference suppression do not use a 5 k  $\Omega$  distributor rotor).
- No external voltage, e. g. ohmmeter, must be connected to the ignition distributor magnetic pickup assembly (Hall generator).  
Caution when switching over measuring ranges.
- The lines from the Hall generator to the trigger box must be laid separately from other lines. There must be at least 100 mm distance between Hall generator lines and the ignition cables and the line from terminal 1 of the trigger box to terminal 1 of the ignition coil (Hall generator will be destroyed).
- The line from the Hall generator to the ignition timing unit and from the ignition timing unit to the trigger box must be shielded (malfunction of ignition timing unit/trigger box).
- The holding springs of the distributor cap must not drop into the pickup system when the engine is being cranked and with the dust-protection cover removed.
- Arcing or breakdown of insulation at the distributor cap (poor insulation) may lead to the destruction of the magnetic pickup assembly and trigger box.
- Do not disconnect the battery while the engine is running.
- Incorrect battery polarity will lead to the destruction of the magnetic pickup assembly of the ignition distributor, trigger box and ignition coil as well as ignition timing unit.
- Do not use a starting aid with more than 16 V or a fast charger for starting.



## 8. Trouble-shooting program

### 8.1 Procedure - trouble-shooting chart

The trouble-shooting chart starting on Coordinate B 3 contains fault symptoms, cause of fault, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate B 7.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.

If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

### 8.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate B 7 is divided into 3 rows of boxes:

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 8.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

**B1**

Trouble-shooting program  
Alfa Romeo

**B2**

Trouble-shooting program  
Alfa Romeo



**Trouble-shooting chart**  
**Customer complaint (fault symptom)**

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

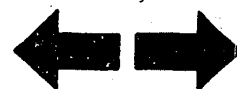
8. Backfiring

9. Engine becomes too hot

									<u>Cause of fault</u>	<u>Test instructions</u>	<u>Coordinate</u>
●	●	●	●	●	●	●	●	●	Not clear	Perform detailed trouble-shooting	B 7
●	●	●	●	●	●		●		Spark plugs defective	Assess using ignition oscillogram or remove spark plug and make visual examination.	-----
●	●	●	●	●	●	●	●	●	Basic ignition timing incorrect	-	B 15
●	●	●	●	●					Shunt on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram or make visual examination.	-----
●	●	●	●	●					Open circuit on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram, or test for continuity using ohm-meter.	-----
●									Open circuit on primary side	-	D 1
●	●	●	●	●					Ignition coil defective	-	B 9

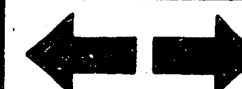
**B3**

Trouble-shooting program  
 Alfa Romeo



**B4**

Trouble-shooting program  
 Alfa Romeo



Trouble-shooting chart  
Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

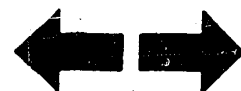
9. Engine becomes too hot

									<u>Cause of fault</u>	<u>Test instructions</u>	<u>Coordinate</u>
		•	•	•	•				Interference-suppression resistors defective	Assess using ignition oscillogram or perform resistance measurement.	-----
						•			Thermo-switch defective	-	B 17 - B 19
		•	•		•	•		•	Vacuum advance defective	See Autodata test specifications	-----
•									Trigger box defective		C 9
•	•	•	•	•	•				Ignition timing unit defective	To avoid incorrect setting, test must be performed as per coordinate reference.	B 15 - C 6
•									Ignition distributor pulse generator defective		D 3 D 4
	•		•	•	•	•		•	Throttle-valve switch defective		B 21 C 1 C 3
•									Firing sequence incorrect	Firing sequence 1 - 4 - 2 - 5 - 3 - 6	-----

**B5**

Trouble-shooting program

Alfa Romeo



**B6**

Trouble-shooting program

Alfa Romeo





yes

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

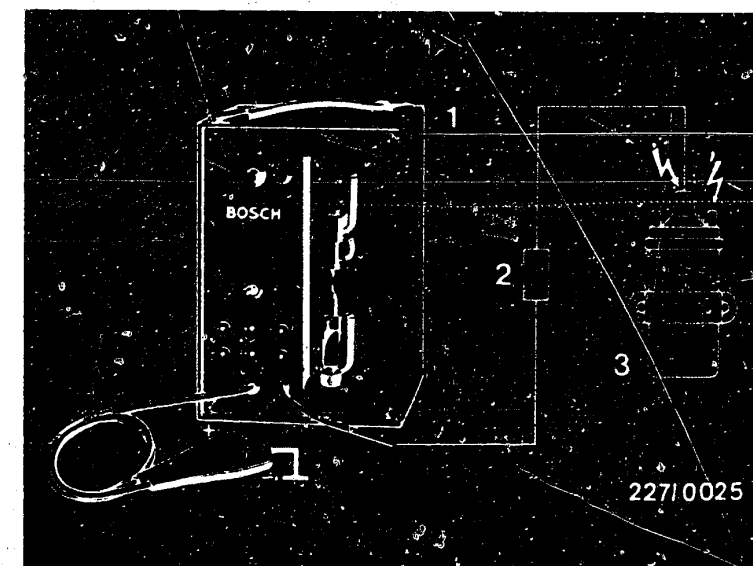
Primary signal present or ignition sparks across spark gap?

yes

Continued on B 9 / B 10

If no primary signal or no ignition spark, continue testing at D 1.

Tests from B 9 onwards not necessary.

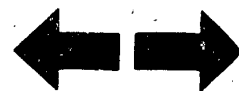


- 1 = Spark gap
- 2 = 5 k $\Omega$  sleeve-type suppressor
- 3 = ignition coil

⚡ = dangerous voltages  
(400 V - 25 kV)

**B7**

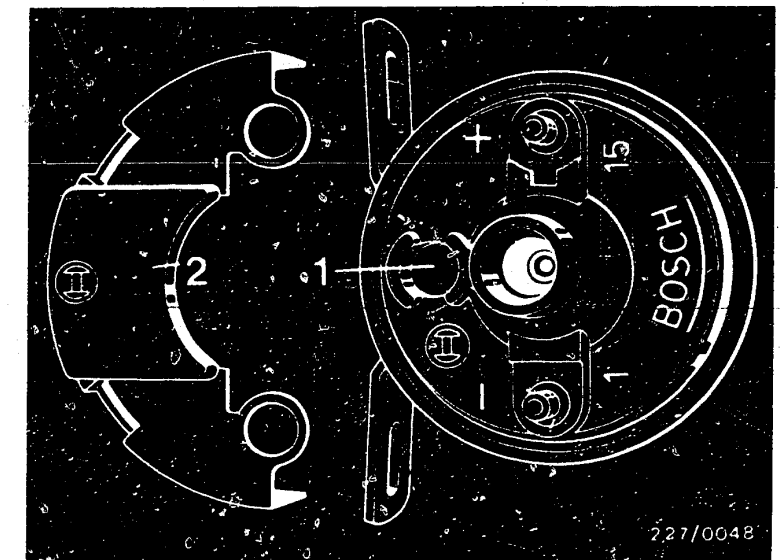
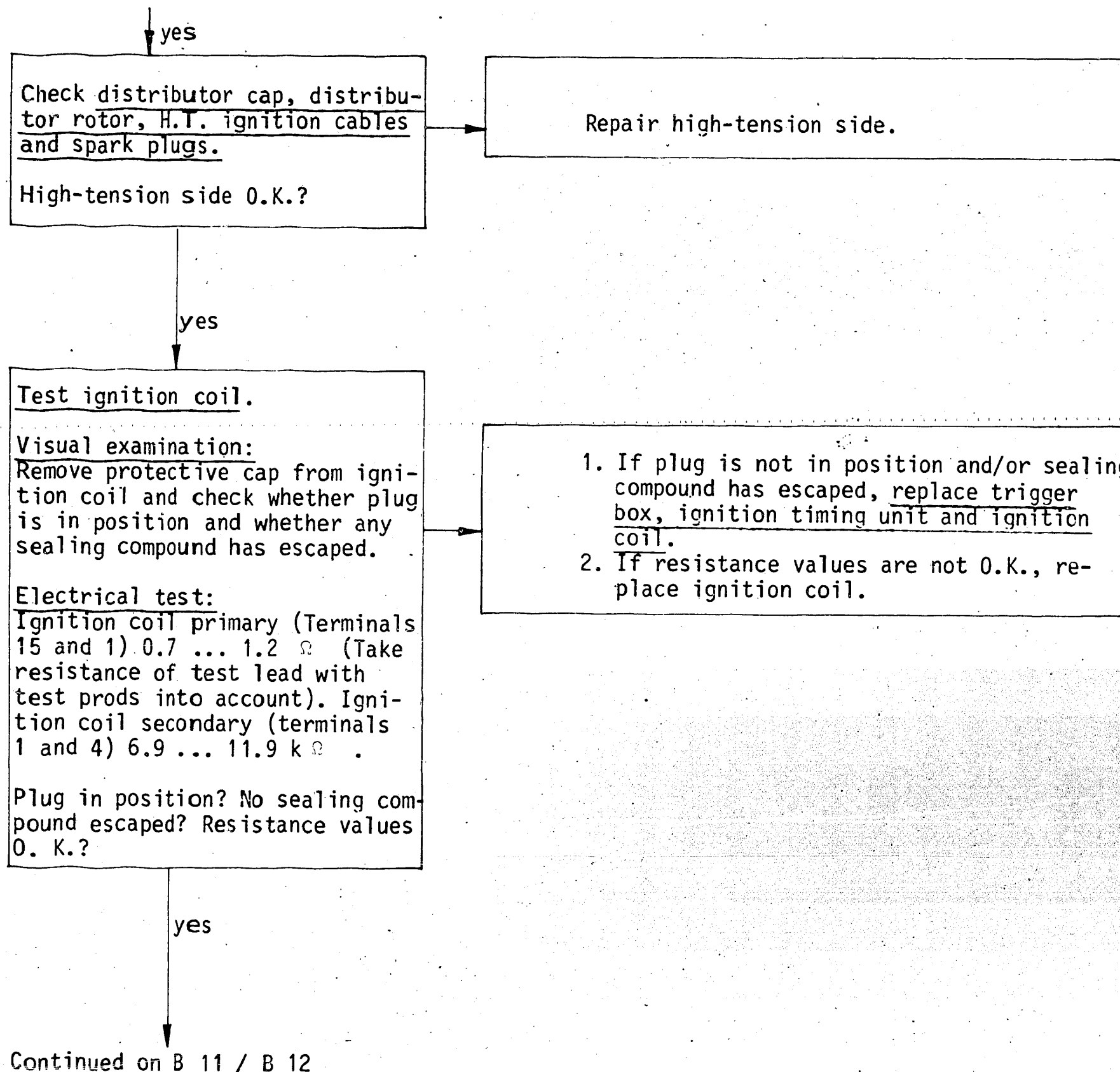
Trouble-shooting program  
Alfa Romeo



**B8**

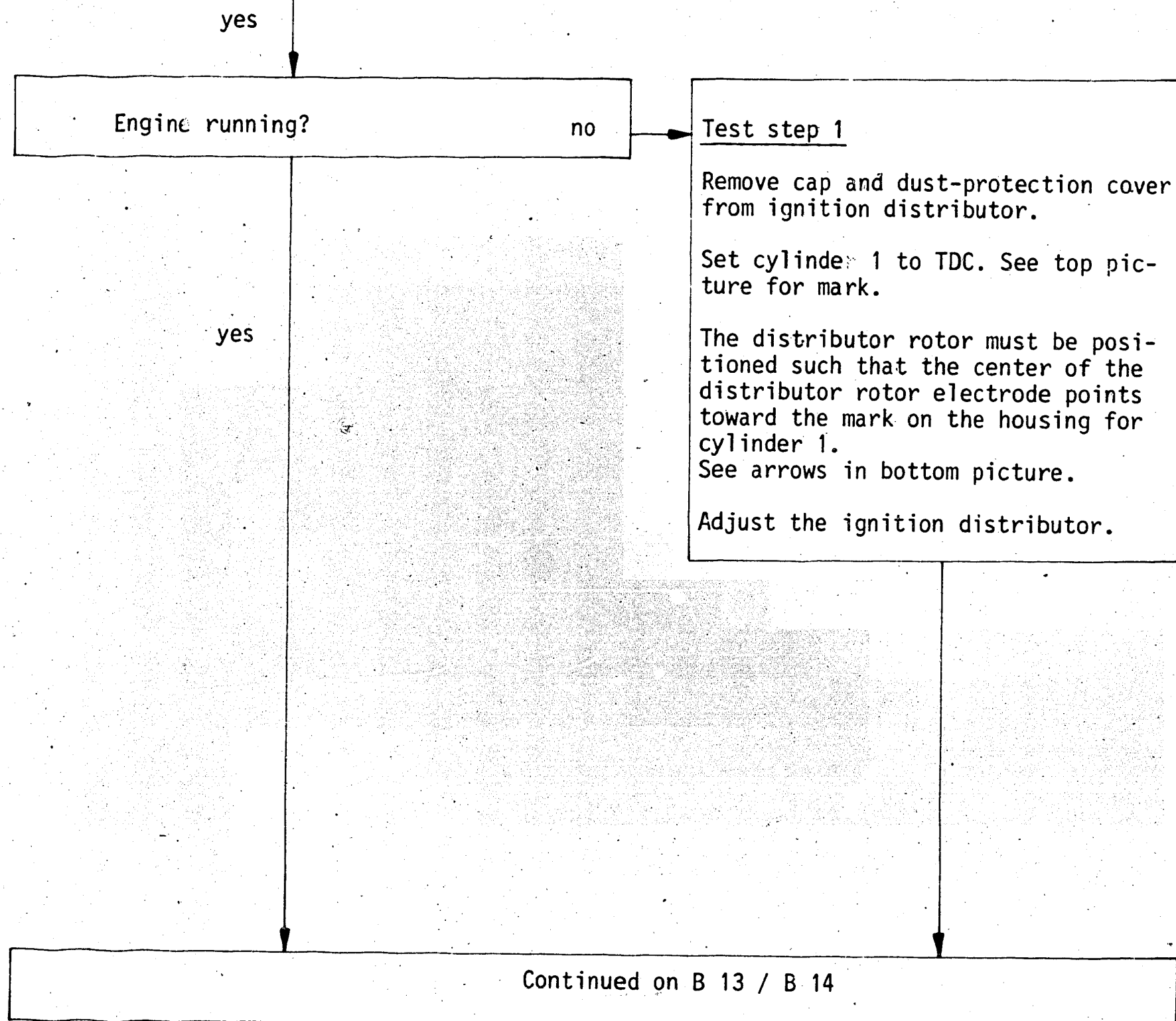
Trouble-shooting program  
Alfa Romeo



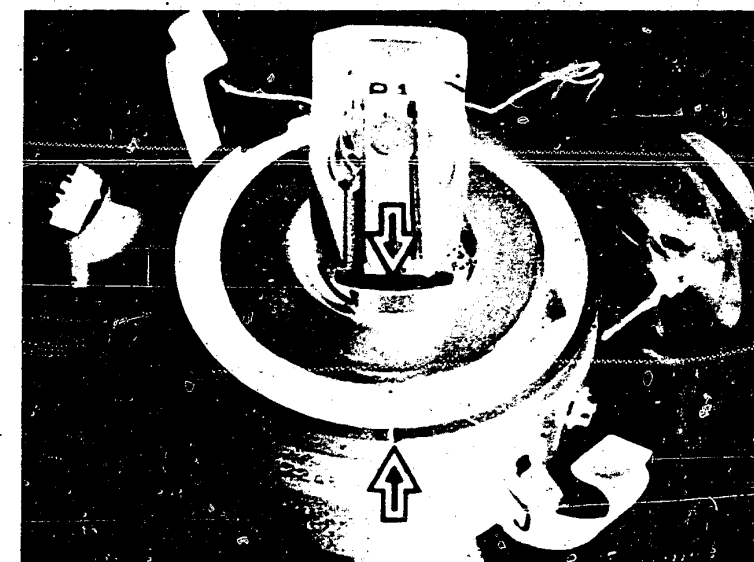


1 = Plug  
2 = Protective cap





F = Ignition timing mark (6° BTDC)  
P = TDC



**B 11**

Trouble-shooting program  
Alfa Romeo



**B 12**

Trouble-shooting program  
Alfa Romeo



Continued

### Test step 2

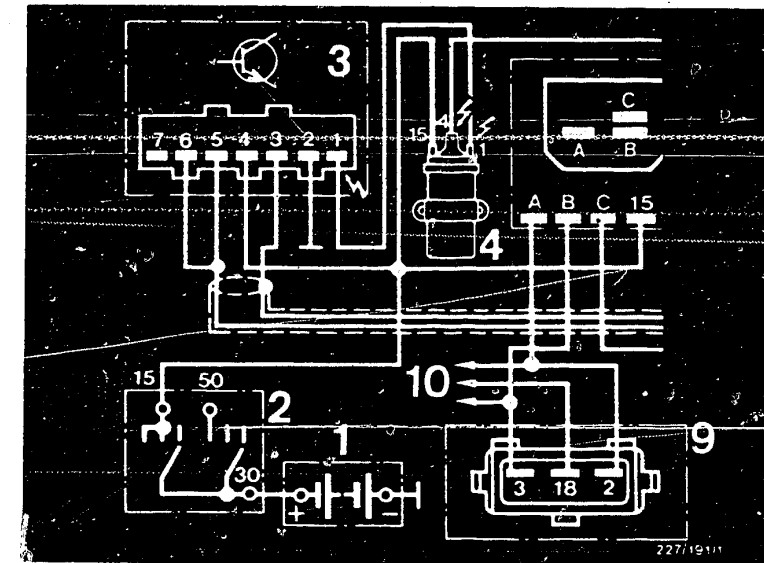
Disconnect negative and positive cables from battery. Remove trigger-box plug. Switch on ignition.

1. Check for contact resistance in cables from positive battery terminal to trigger-box plug term. 4 including cables from negative battery terminal to trigger-box plug term. 2. Total contact resistance max. 0.5  $\Omega$  (take resistance of test lead with test prods into account). Eliminate contact resistance.
2. Check for contact resistance in cables from positive battery terminal to ignition coil term. 15 as well as in cable from ignition coil term. 1 to trigger-box plug term. 1. Total contact resistance max. 0.5  $\Omega$  (take resistance of test lead with test prods into account). Eliminate contact resistance.

If test steps 1 and 2 O.K., replace trigger box.

yes

Continued on B 15 / B 16

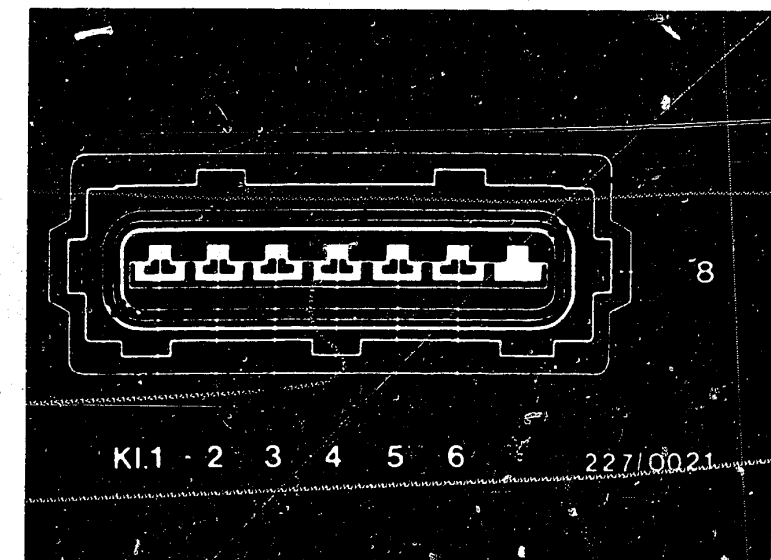


Section from terminal diagram

- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition coil

⚡ = dangerous voltages  
(400 V - 25 kV)

8 = Trigger-box plug



**B 13**

Trouble-shooting program  
Alfa Romeo



**B 14**

Trouble-shooting program  
Alfa Romeo



yes

Check basic ignition timing.

(If indication of engine speed on tester is clearly incorrect, connect in series resistor).

Remove vacuum hose from vacuum advance mechanism (ignition distributor).

Remove 4-pin ignition timing unit plug. See top picture.

Start the engine and allow to idle (800 - 900 min<sup>-1</sup>).

Basic ignition timing must be 6° BTDC.

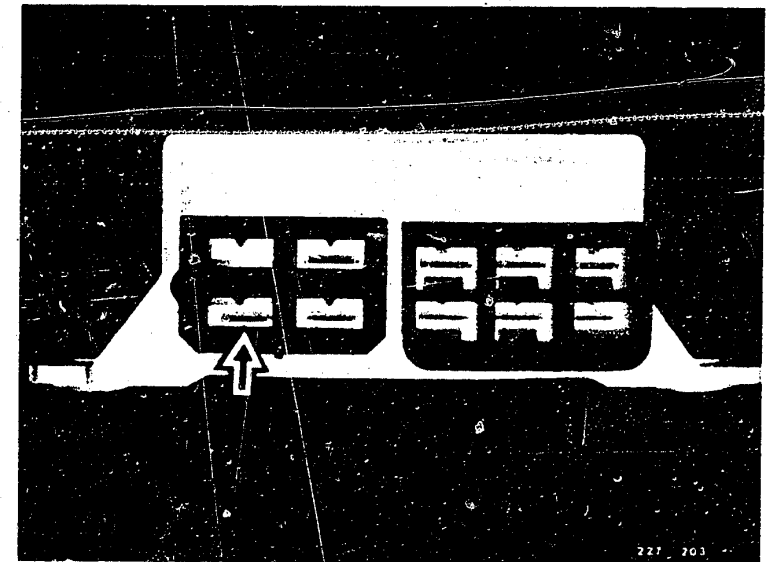
See bottom picture for mark.

Basic ignition timing correct?

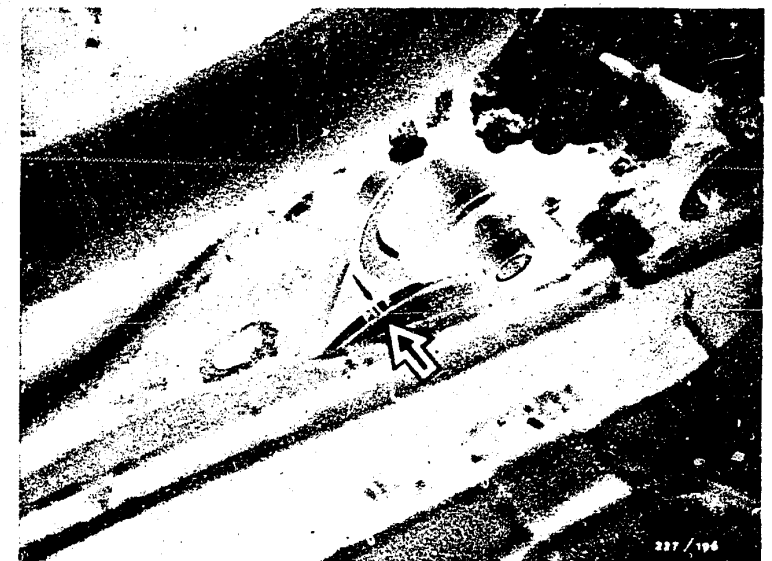
yes

Continued on B 17 / B 18

Loosen the distributor mounting and turn the distributor until 6° BTDC is reached.



F = Ignition timing mark  
(6° BTDC)  
P = TDC



**B 15**

Trouble-shooting program  
Alfa Romeo



**B 16**

Trouble-shooting program  
Alfa Romeo



yes

Check the electric lead from thermo-switch.

Using an extra lead, connect the electric terminal of the thermo-switch to ground.

Remove 4-pin ignition timing unit plug.

Connect ohmmeter to 4-pin ignition timing unit plug term.C and ground.

Ohmmeter must indicate continuity.

O. K.?

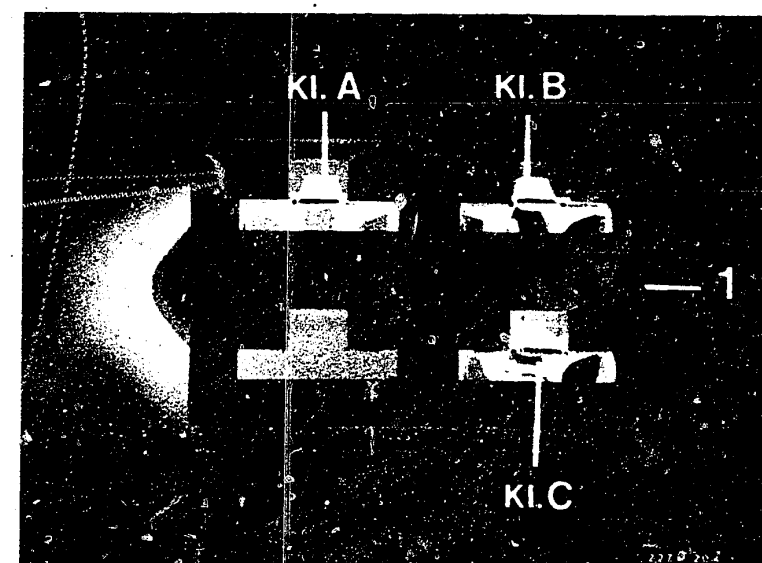
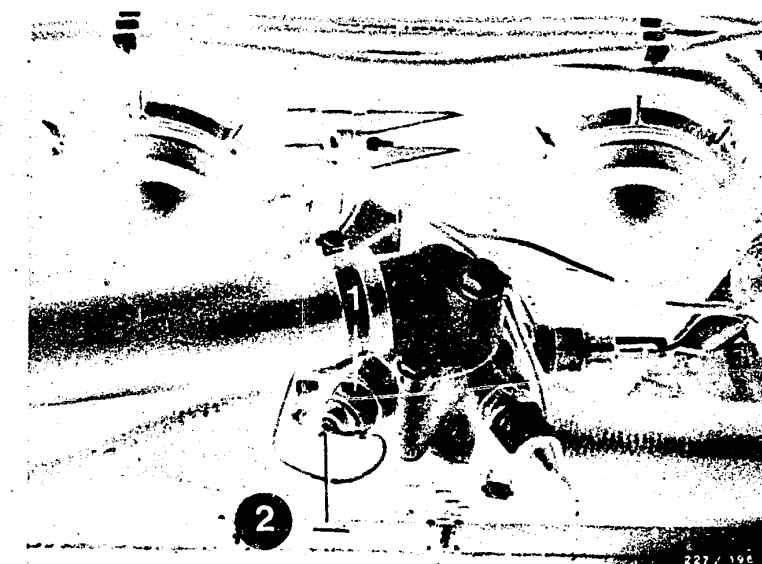
Eliminate open circuit between 4-pin ignition timing unit plug term.C and thermo-switch.

1 = Thermo-switch  
2 = Extra lead

1 = 4-pin ignition timing unit plug

yes

Continued on B 19 / B 20



**B17**

Trouble-shooting program  
Alfa Romeo



**B18**

Trouble-shooting program  
Alfa Romeo





yes

### Test thermo-switch.

Remove extra lead from thermo-switch.

Engine must be warm (water temperature  $> 60^{\circ}\text{C}$ ).

Remove 4-pin ignition timing unit plug.

Connect ohmmeter to 4-pin ignition timing unit plug term. C and ground.

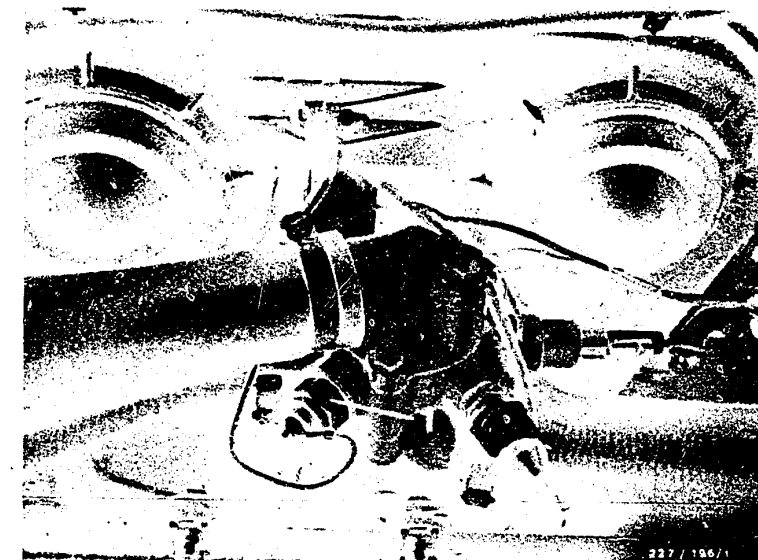
Ohmmeter must indicate open circuit.

O. K. ?

Replace thermo-switch.

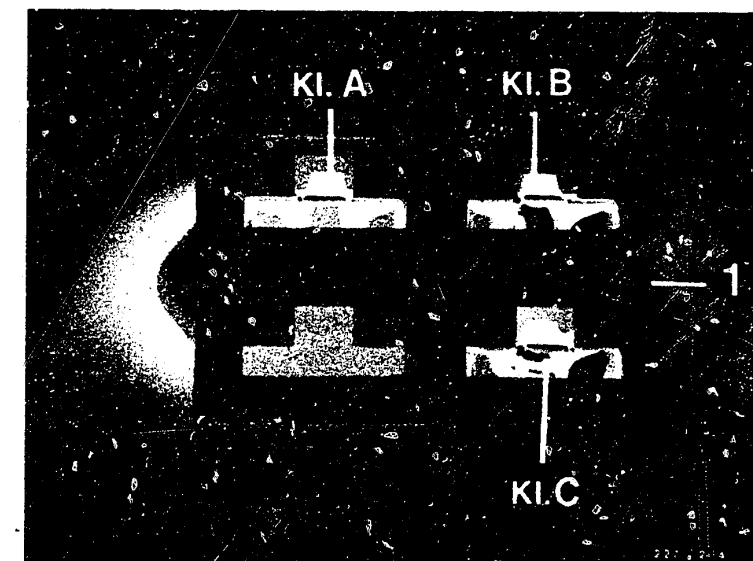
yes

Continued on B 21 / B 22



1 = Thermo-switch

1 = 4-pin ignition timing unit plug



**B 19**

Trouble-shooting program  
Alfa Romeo



**B 20**

Trouble-shooting program  
Alfa Romeo



yes

Test control voltage of throttle-valve switch.

1. Connect voltmeter to disconnected 4-pin ignition timing unit plug term. A and ground (throttle valve in idle position).

Switch on ignition.

Voltmeter must indicate  $> 2.8V$ .

2. Connect voltmeter to disconnected 4-pin ignition timing unit plug term. B and ground.

Switch on ignition.

Accelerator in full-load position.

Voltmeter must indicate  $> 2.8 V$ .

Voltage reading correct in Points 1 and 2?

yes

1. If voltage  $< 2.8 V$ , then test L-Jetronic control unit.

2. If no voltage was indicated, then remove plug from throttle-valve switch. Connect ohm-meter to throttle-valve switch term. 2 and term. 18.

Throttle valve is closed

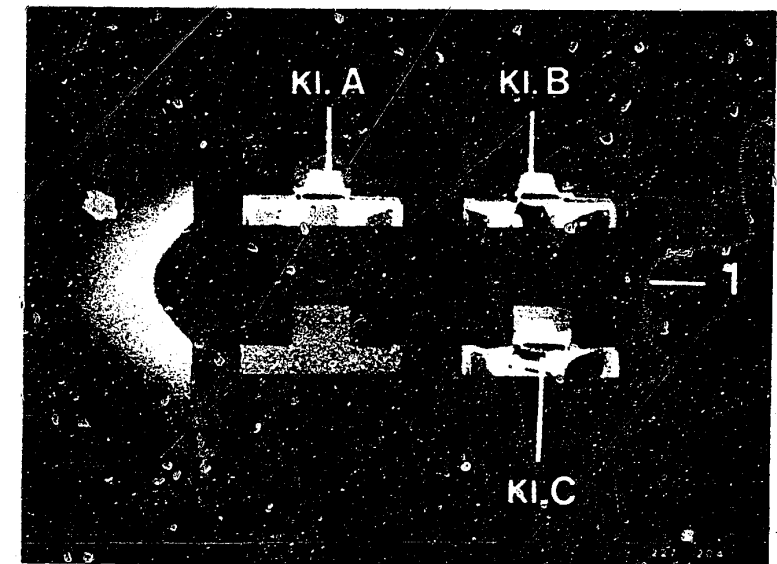
Resistance approx.  $0 \Omega$ .

If resistance  $\infty$  (infinity), first of all adjust the throttle-valve switch. To do this, loosen the fastening screws slightly: turn the throttle-valve switch until the idle contact (microswitch) can be heard to click (reading  $0 \Omega$ ). If the resistance is still  $\infty$ , then replace the throttle-valve switch.

Checking the adjustment:  
Move the throttle linkage slightly (slightly open the throttle valve).

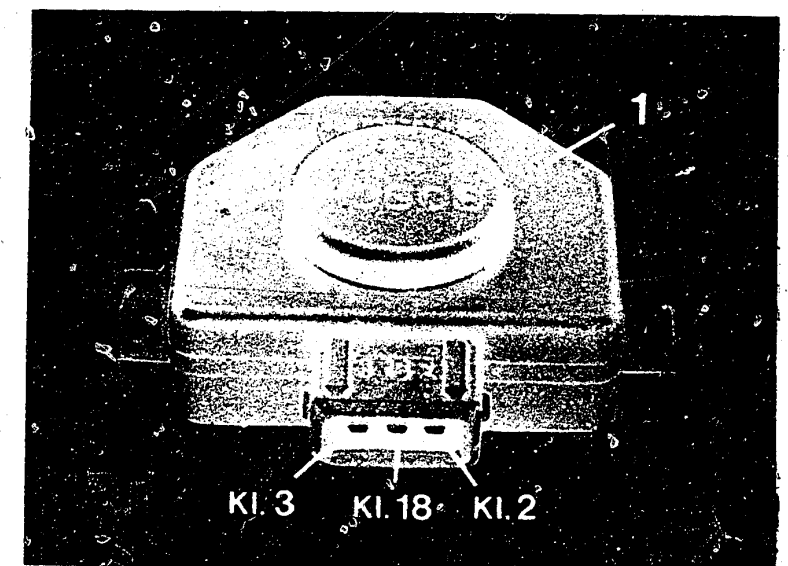
The idle contact must be heard to click (reading  $\infty \Omega$ ).

Continued on C 1 / C 2



1 = 4-pin ignition timing unit plug

1 = Throttle-valve switch



**B21**

Trouble-shooting program  
Alfa Romeo



**B22**

Trouble-shooting program  
Alfa Romeo





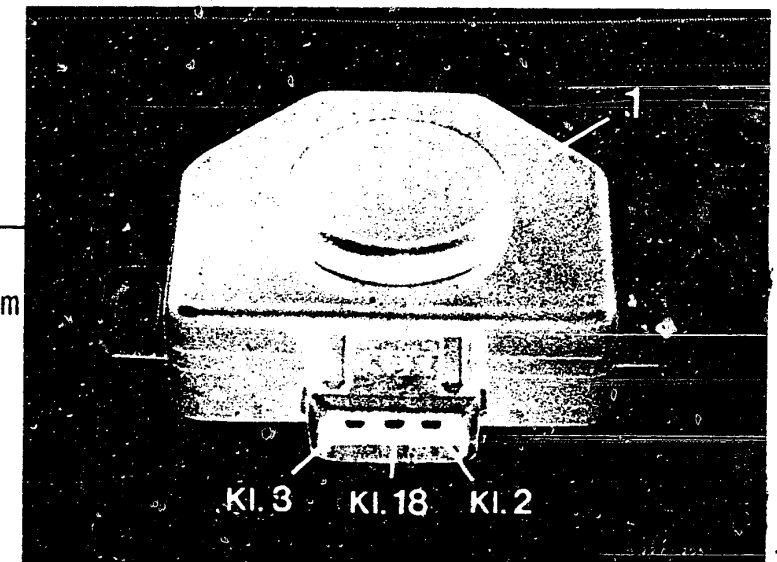
Continued

3. Connect ohmmeter to throttle-valve switch term  
3 and term.18

Open throttle valve fully

Resistance approx.  $0\Omega$

If resistance  $\infty$  , replace throttle-valve switch.



1 = Throttle-valve switch

yes

Continued on C 3 / C 4

**C1**

Trouble-shooting program  
Alfa Romeo



**C2**

Trouble-shooting program  
Alfa Romeo

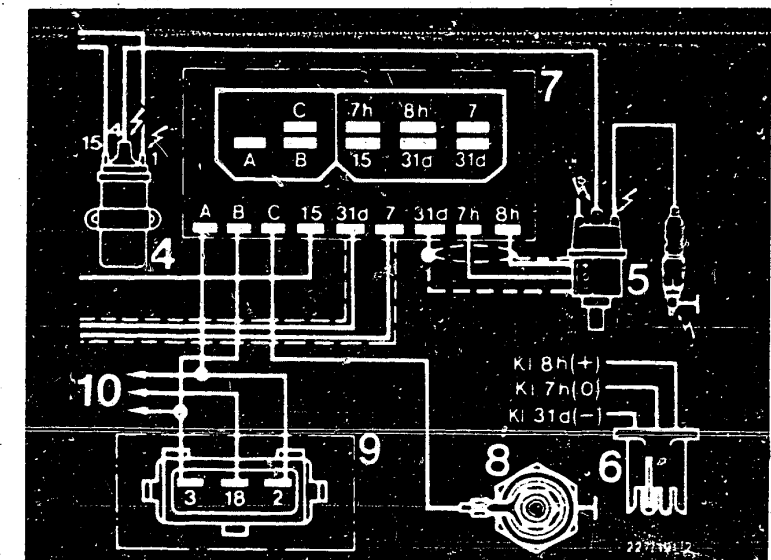


Continued

If approx. 0  $\Omega$  was measured for test steps 2 and 3, then check for open circuit in the cable connection from 4-pin ignition timing unit plug term. A and term. B to throttle-valve switch plug term.2 and term.3. Eliminate open circuit.

yes

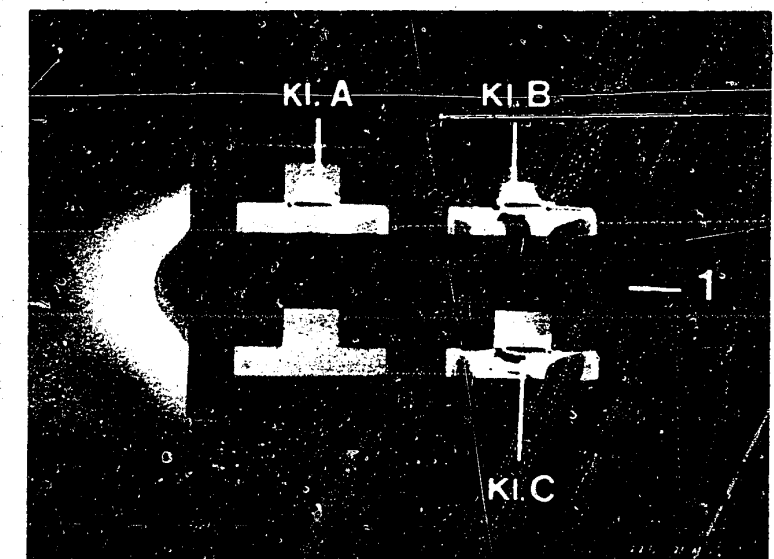
Continued on C 5 / C. 6



Section from terminal diagram

- 7 = Ignition timing unit
- 8 = Thermo-switch
- 9 = Throttle-valve switch
- 10 = to L-Jetronic

- 1 = 4-pin ignition timing unit plug
- ⚡ = dangerous voltages (400 V - 25 kV)



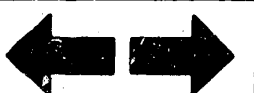
**C3**

Trouble-shooting program  
Alfa Romeo



**C4**

Trouble-shooting program  
Alfa Romeo



yes

Test the spark advance.

1. Part-load spark advance, warm

Remove 4-pin ignition timing unit plug.

Remove vacuum hose from vacuum advance mechanism (ignition distributor).

At  $3000 \text{ min}^{-1}$  the spark advance must be  $25^{\circ} \dots 28^{\circ}$  (crankshaft).

2. Part-load spark advance, cold

Plug on 4-pin ignition timing unit plug.

Using an extra lead, connect electric terminal of thermo-switch to ground. See bottom picture.

At  $3000 \text{ min}^{-1}$  the spark advance must be  $16^{\circ} \dots 19^{\circ}$  (crankshaft).

Spark advance correct for Points 1 and 2?

Replace ignition timing unit.

yes

Continued on C 7 / C 8

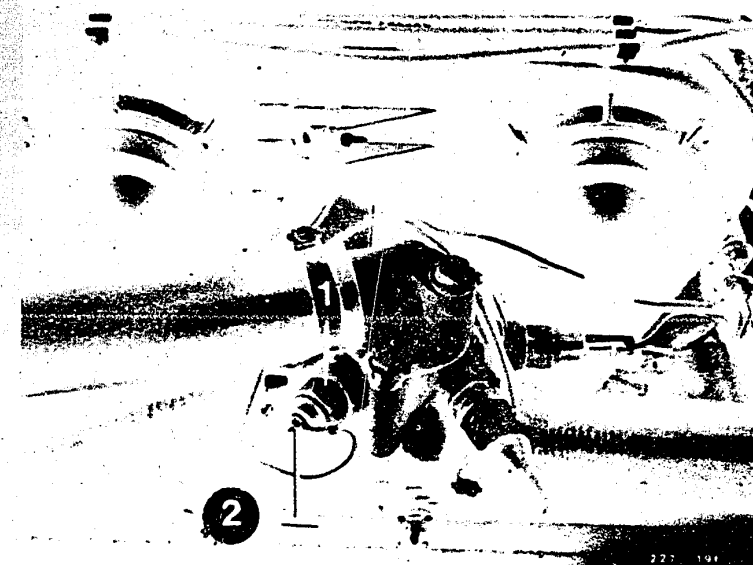


F = Ignition timing mark ( $6^{\circ}$  BTDC)

P = TDC

1 = Thermo-switch

2 = Extra lead



**C5**

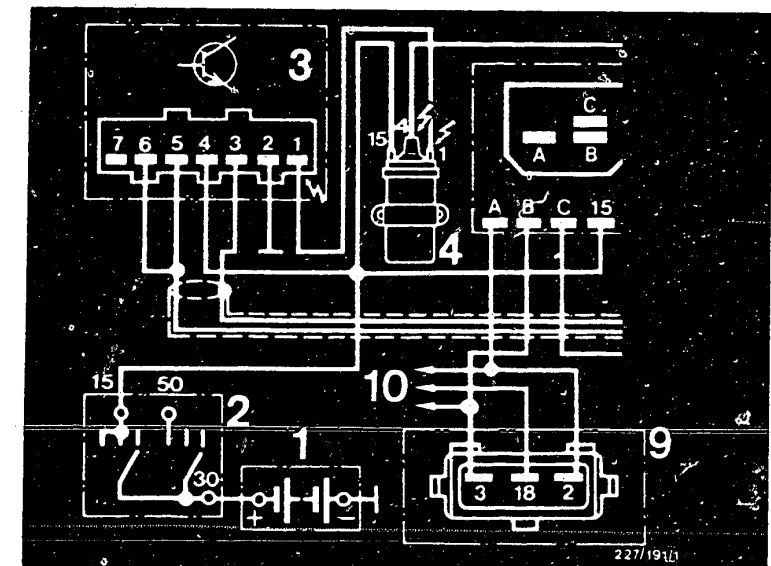
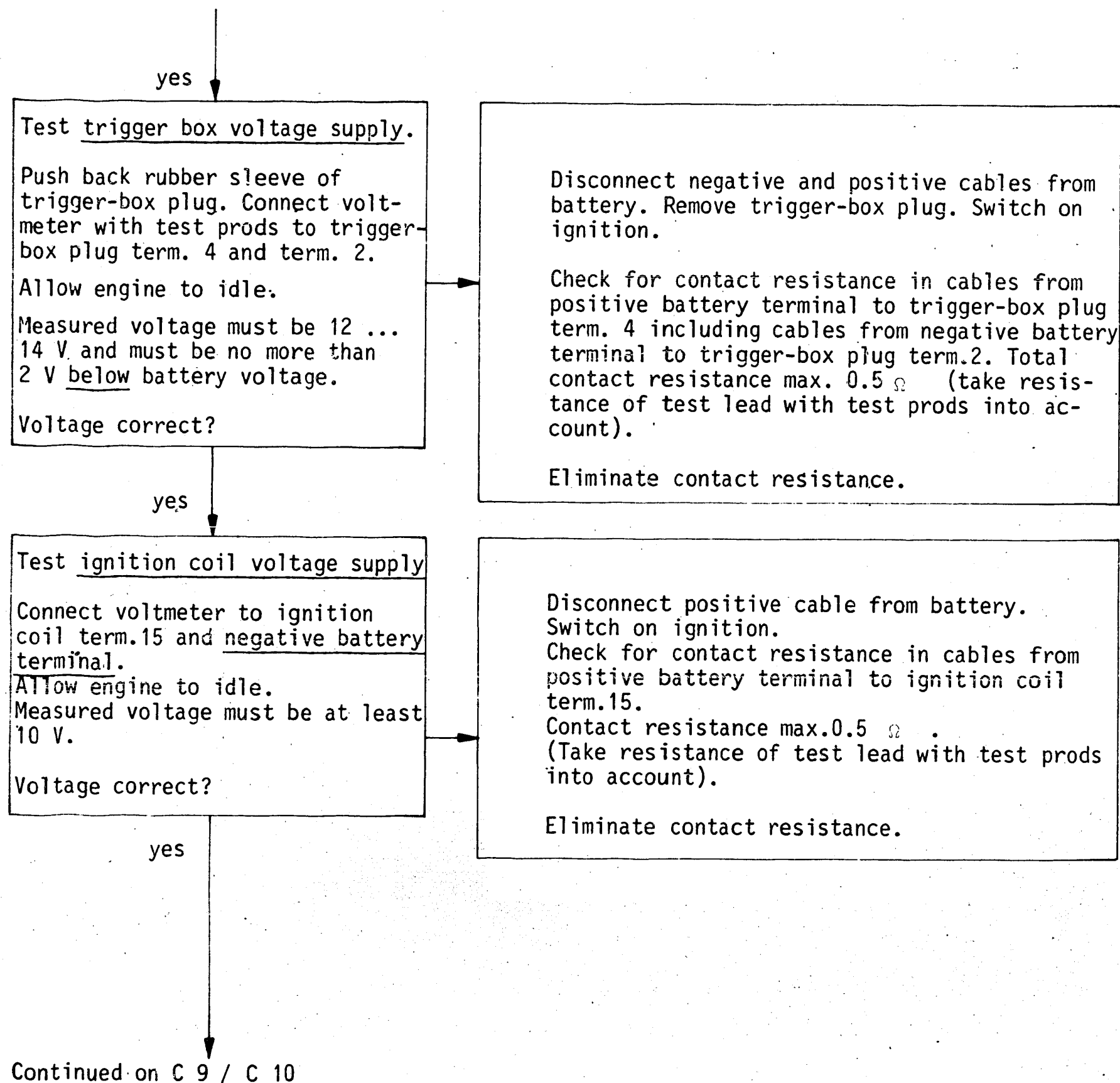
Trouble-shooting program  
Alfa Romeo



**C6**

Trouble-shooting program  
Alfa Romeo



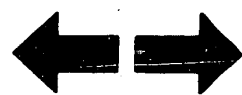
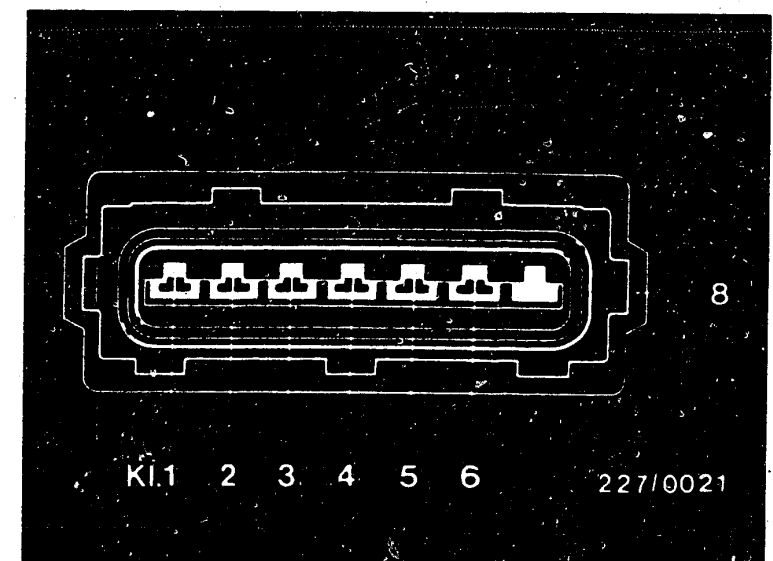


Section from terminal diagram

- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition coil

= dangerous voltages  
(400 V - 25 kV)

8 = Trigger-box plug



yes

Test primary voltage.

(If MOT series available).

Connect oscilloscope (e. g. MOT 201) to ignition coil as per operating instructions.

Allow engine to idle.

Measured primary voltage must be 295-365 V. See graph.

Voltage correct?

Replace trigger box.

yes

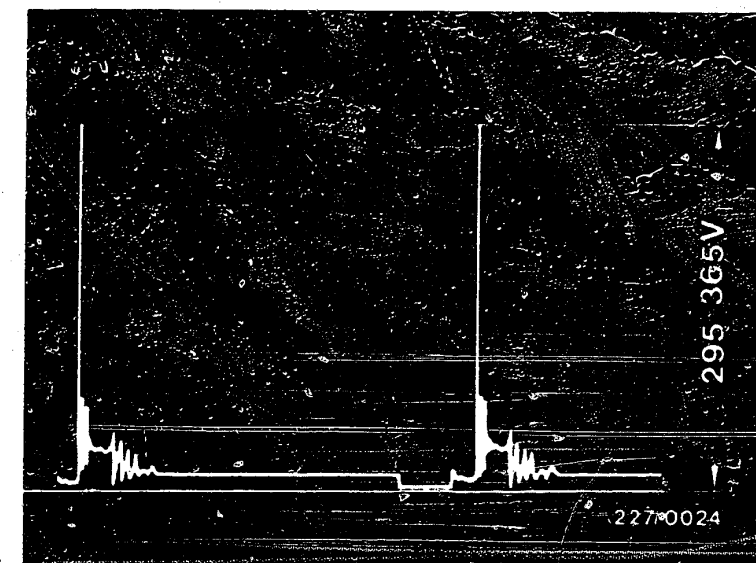
Ignition system O.K.

Test completed

Tests starting at D 1 no longer necessary.

Note:

If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O.K.



**C9**

Trouble-shooting program

Alfa Romeo



**C10**

Trouble-shooting program

Alfa Romeo



No primary signal/no ignition  
spark  
(Continued from B 9/B 10).

yes

Test trigger-box voltage supply.  
Remove trigger-box plug.  
Connect voltmeter to trigger-box  
plug between term.4 and term.2.  
Switch on ignition. Voltmeter  
must indicate battery voltage.

Check for open circuit in cables and ter-  
minals from ignition and starting switch  
to trigger-box plug term.4 including ground  
cable term.2. Eliminate open circuit.

yes

Test primary circuit.

Connect voltmeter to disconnected  
trigger-box plug between term. 1  
and term. 2.  
Switch on ignition:

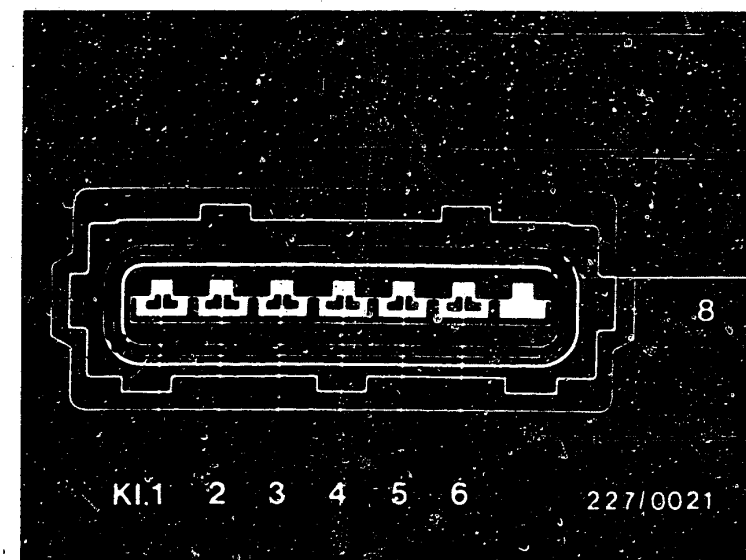
Voltmeter must indicate battery  
voltage.

Voltage correct?

Check for open circuit in cable from igni-  
tion and starting switch to ignition coil  
term. 15, in the primary winding of the ig-  
nition coil, in the cable from ignition coil  
term. 1 to trigger-box plug term. 1 and in  
the ground cable term. 2.  
Eliminate open circuit.

yes

Continued on D 3

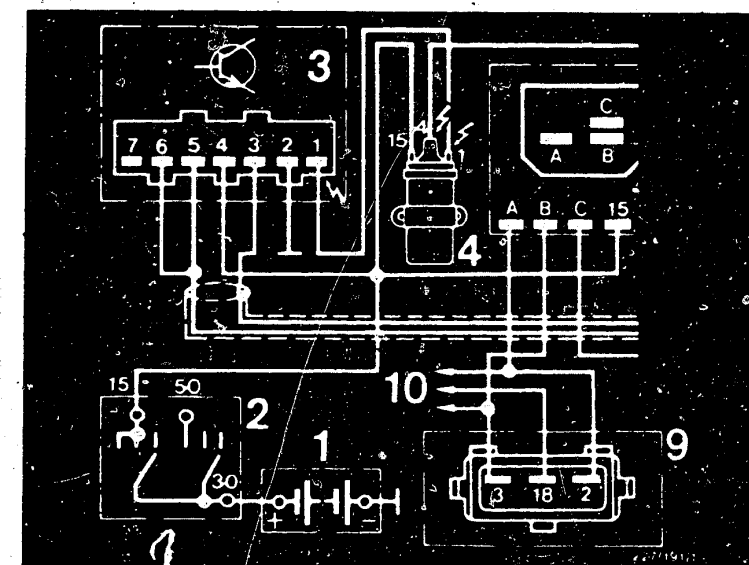


8 = Trigger-box plug

Section from terminal diagram

1 = Battery  
2 = Ignition and starting switch  
3 = Trigger box  
4 = Ignition coil

⚡ = dangerous voltages  
(400 V - 25 kV)



D1

Trouble-shooting program  
Alfa Romeo

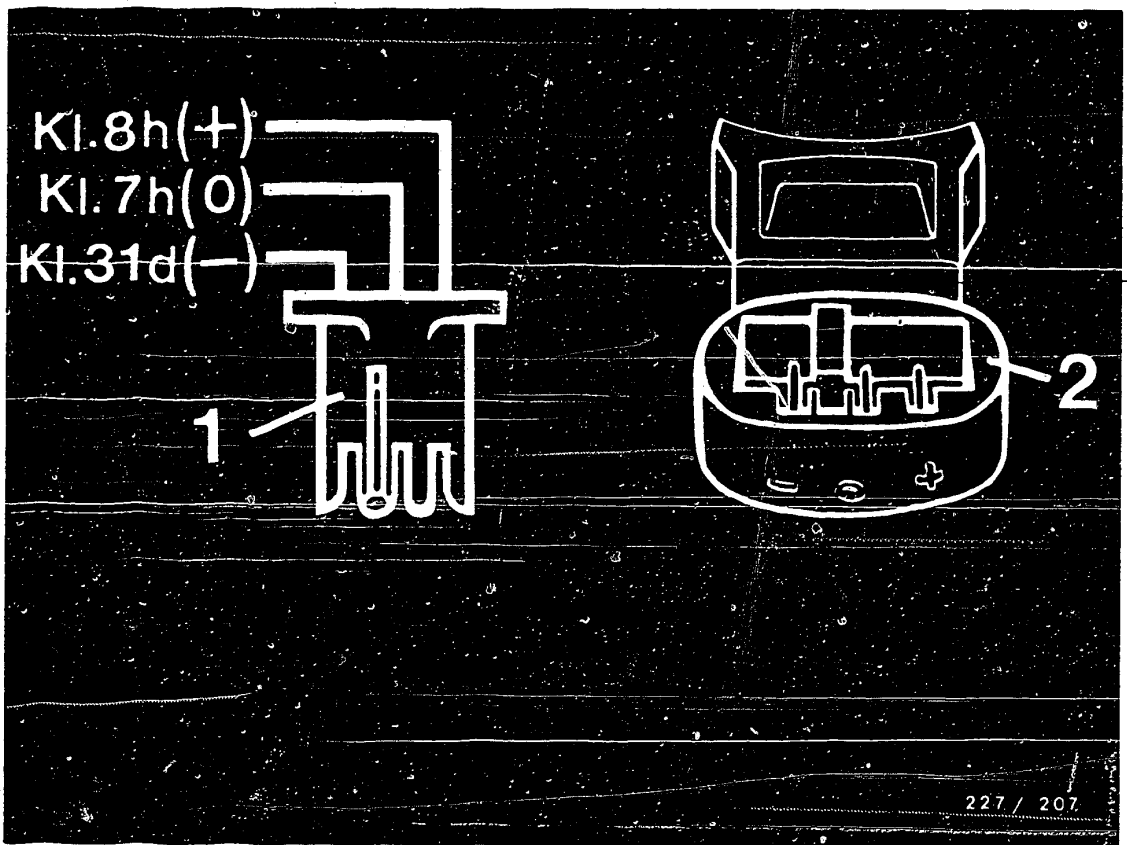


D2

Trouble-shooting program  
Alfa Romeo







- 1 = Ignition-distributor connector  
2 = Ignition-distributor socket

yes

Test connector and socket of ignition distributor.

Visual examination:

Remove the ignition-distributor connector (see picture) and check contacts for oxidation and correct latching (remedy defects).

Reconnect ignition-distributor connector. If customer complaint not remedied, continue testing.

yes

Continued on D 4 / D 5



yes

Test pulse generator voltage supply.

Plug on trigger-box plug. Push back rubber sleeve of ignition-distributor connector.

Connect voltmeter with test prods to term. 8h and term. 31d.

Switch on ignition.

Voltmeter must indicate a voltage of > 6V.

Voltage correct?

no

Remove ignition-distributor connector and ignition timing unit plug.

Connect ohmmeter with test prods one after the other.

1. <u>Ignition-distributor connector</u>	<u>Ignition timing unit plug</u>
--	----------------------------------

Term. 8h	and term. 8h
Term. 31d	and term. 31d
	(next to term. 15)

Ohmmeter must indicate continuity in both cases. Eliminate open circuit.

2. <u>Ignition timing unit plug</u>	<u>Trigger-box plug</u>
-------------------------------------	-------------------------

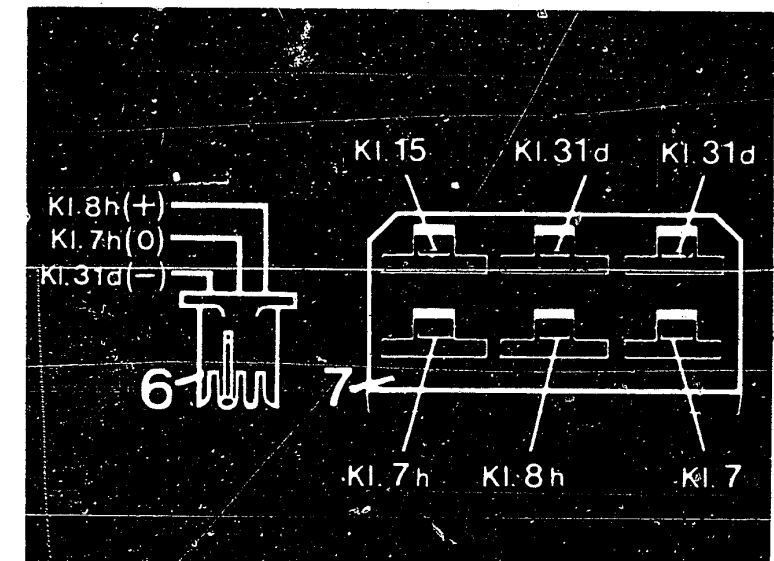
Term. 31 d	and term. 3
(next to term. 15)	
Term. 15	and term. 4

Ohmmeter must indicate continuity in both cases. Eliminate open circuit.

If there was no open circuit in Points 1 and 2, replace ignition timing unit.

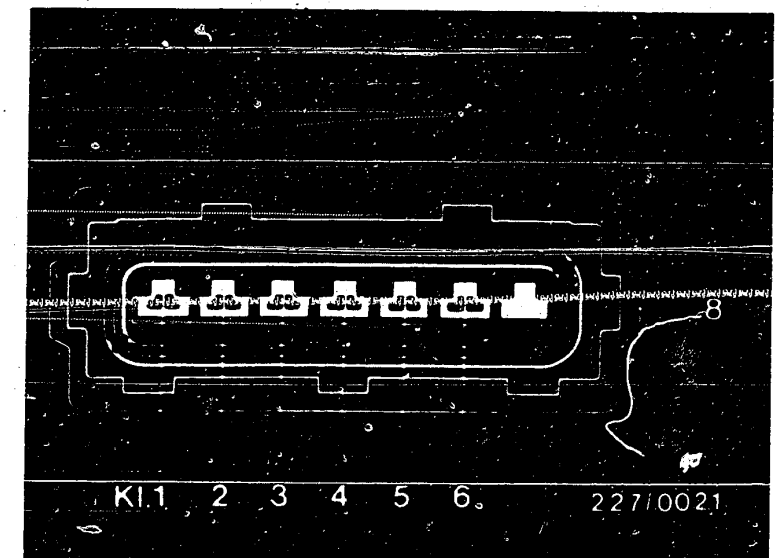
yes

Continued on D 6 / D 7



6 = Ignition-distributor connector  
7 = Ignition timing unit plug

8 = Trigger-box plug



D4

Trouble-shooting program  
Alfa Romeo



D5

Trouble-shooting program  
Alfa Romeo





yes

Test operation of pulse generator.

Trigger-box plug and ignition timing unit plug plugged on.

Push back rubber sleeve of ignition-distributor connector.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example, MOT 201:

Red clip with test prod to ignition-distributor connector term. 7 h (measured signal).

Black clip to ground.

Start engine.

The oscilloscope must show a rectangular pulse. See graph.

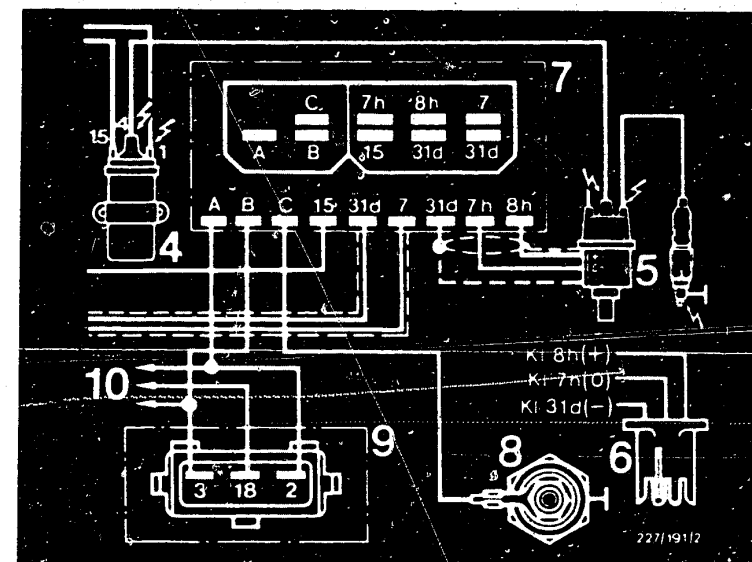
Rectangular pulse present?

no

Replace pulse generator/ignition distributor.

yes

Continued on D 8 / D 9

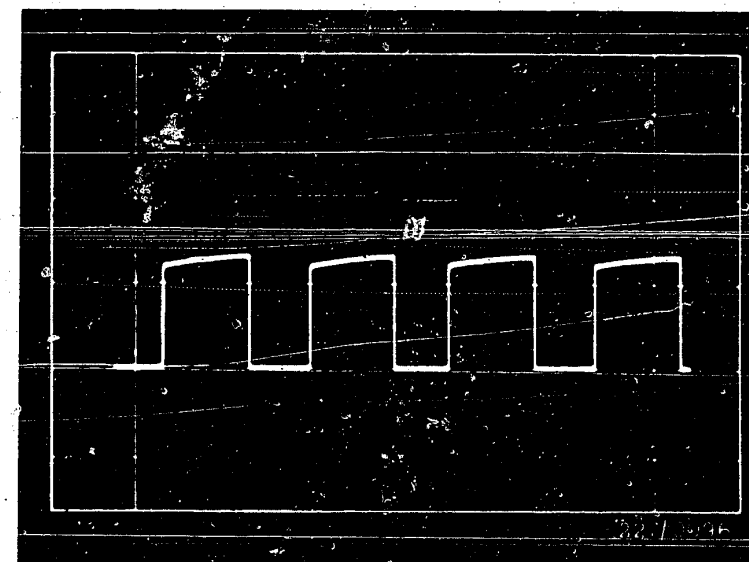


Section from terminal diagram

5 = Ignition distributor  
6 = Ignition-distributor connector  
7 = Ignition timing unit

⚡ = dangerous voltages  
(400 V - 25 kV)

Rectangular pulse



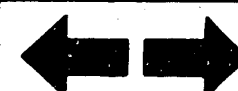
**D6**

Trouble-shooting program  
Alfa Romeo



**D7**

Trouble-shooting program  
Alfa Romeo



yes

### Test ignition timing unit.

Push back rubber sleeve of trigger-box plug.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example, MOT 201:

Red clip with test prods to trigger-box plug term. 5 (measured signal).

Black clip to ground.

Start engine.

The oscilloscope must show a rectangular pulse. (See graph)

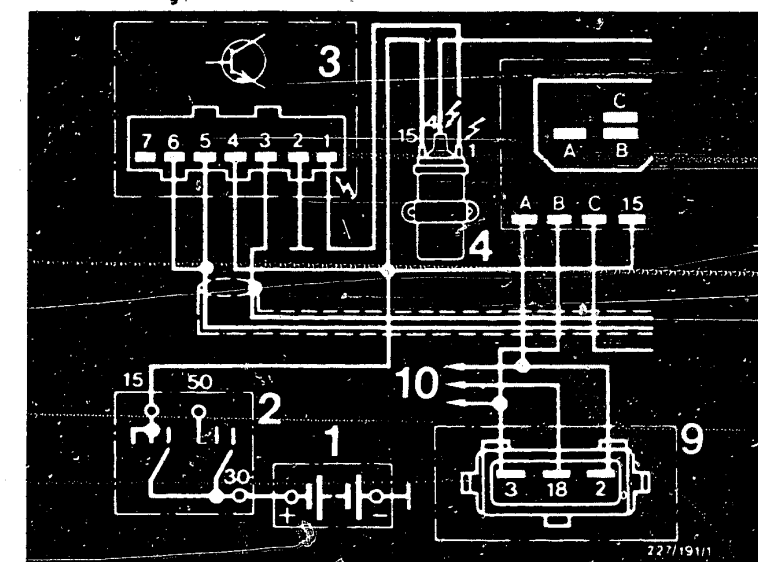
Rectangular pulse present?

no

Remove ignition-distributor connector and ignition timing unit plug.

yes

Continued on D 10 / D 11

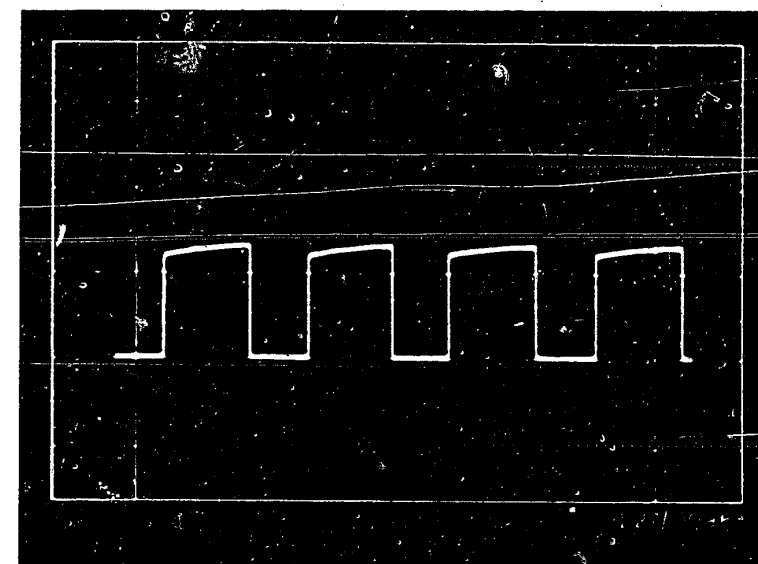


Section from terminal diagram

- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box

⚡ = dangerous voltages  
(400 V - 25 kV)

Rectangular pulse



**D8**

Trouble-shooting program  
Alfa Romeo



**D9**

Trouble-shooting program  
Alfa Romeo



Continued

Connect ohmmeter consecutively to:

<u>Ignition-distributor</u> <u>connector</u>		<u>Ignition timing</u> <u>unit plug</u>
---	--	--

Term. 7 h                      and                      term. 7 h

<u>Ignition timing</u> <u>unit plug</u>		<u>Trigger-box</u> <u>plug</u>
--	--	-----------------------------------

Term. 7                      and                      term. 5

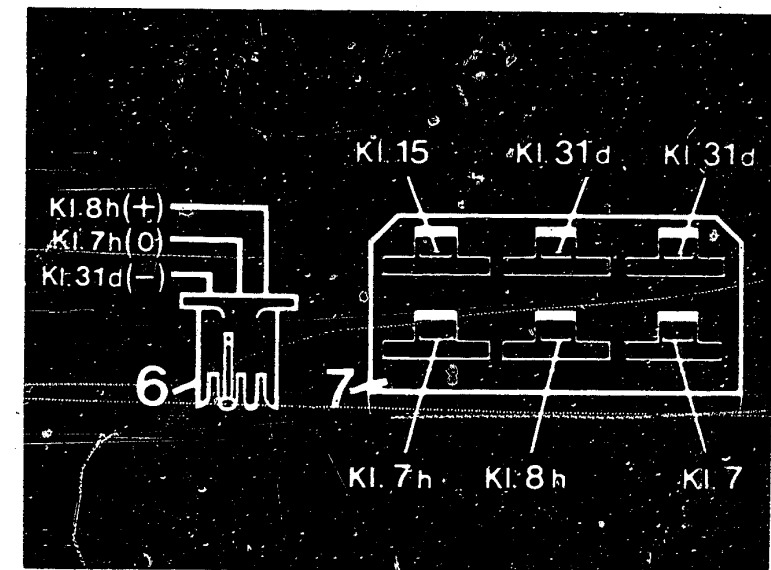
Ohmmeter must indicate continuity in both cases.

Eliminate open circuit.

If there was no open circuit, replace ignition timing unit.

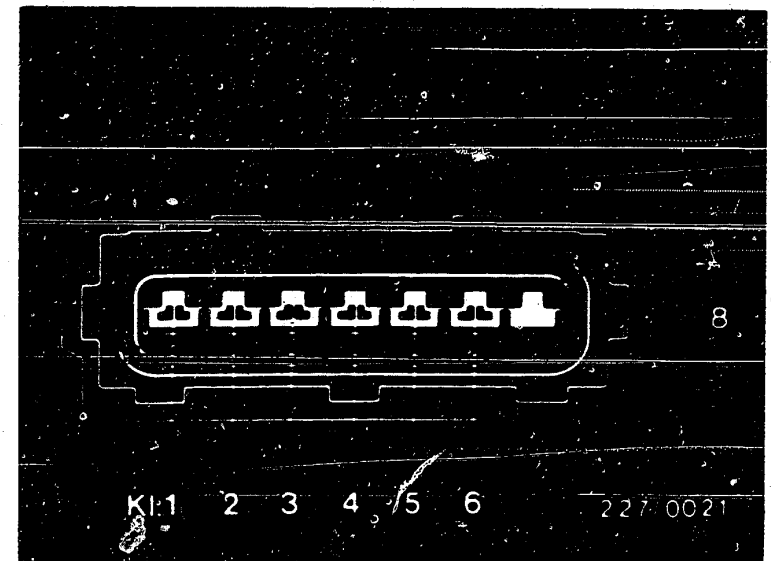
yes

Continued on D 12 / D 13



6 = Ignition-distributor connector  
7 = Ignition timing unit plug

8 = Trigger-box plug



**D10**

Trouble-shooting program  
Alfa Romeo



**D11**

Trouble-shooting program  
Alfa Romeo



yes

### Test ignition coil.

#### Visual examination:

Remove protective cap from ignition coil and check whether plug (see picture) is in position and whether any sealing compound has escaped.

#### Electrical test:

Ignition coil primary (term. 15 and term. 1) 0.7 ... 1.2  $\Omega$   
(take resistance of test lead with test prods into account).

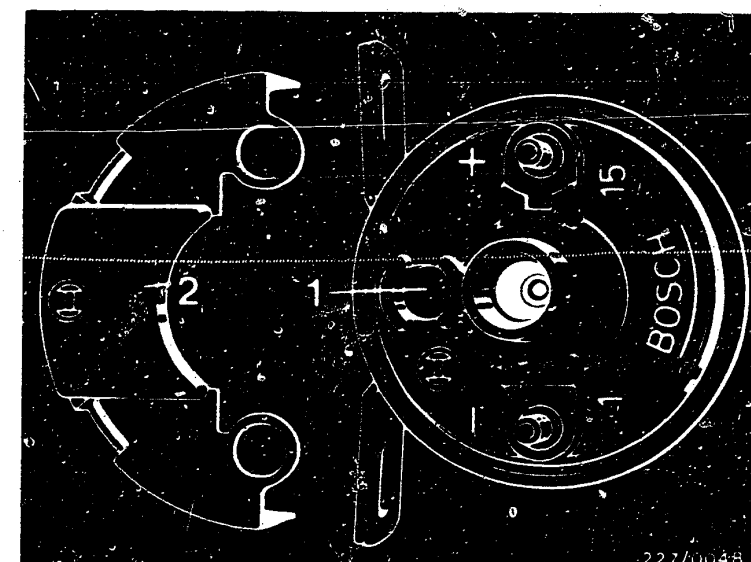
Ignition coil secondary (term. 1 and term. 4) 6.9 ... 11.9 k  $\Omega$

Plug in position? No sealing compound escaped?

Resistance value O.K.?

no

1. If plug is not in position and/or sealing compound has escaped, replace trigger-box, ignition timing unit and ignition coil.
2. If resistance values are not O.K., replace ignition coil.



1 = Plug  
2 = Protective cap

yes

Replace trigger box.

### Test completed.

Tests from B 9 not necessary.

#### Note:

If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O. K.

**D12**

Trouble-shooting program

Alfa Romeo



**D13**

Trouble-shooting program

Alfa Romeo



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

22

### Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufacturers starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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**L1**

Technical Bulletin

Alfa Romeo

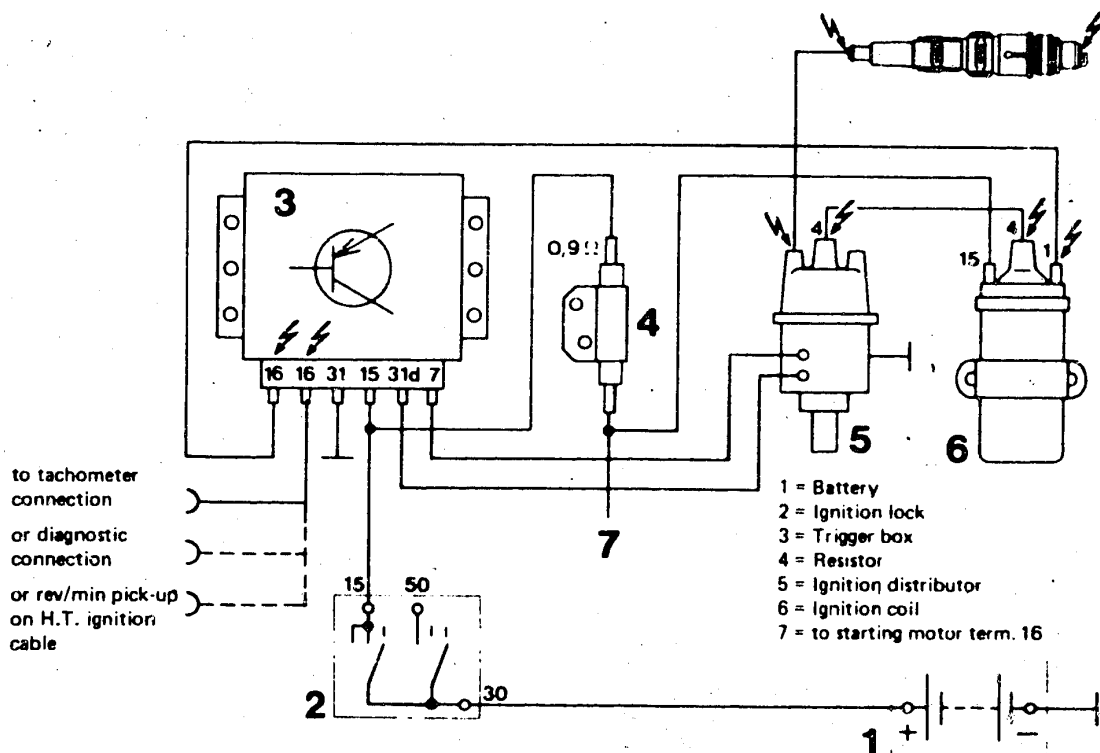


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system; the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

EFFECTS OF ELECTRICAL AND ELECTRONIC  
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En

1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.





# After-sales Service

## Technical Bulletin

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### BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

22

#### Warranty note

VDT-I-227/103 En  
3.1979

hybrid construction trigger boxes  
0 227 100 100 for ignition distributor  
with Hall generator (TCI-h)  
0 227 100 102 for ignition distributor  
with induction-type  
pulse generator (TCI-i)

Apart from the well-known TCI trigger boxes 0 227 100 0... , trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

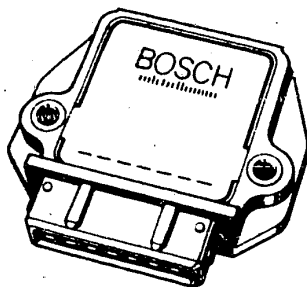


Fig. 1

#### Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH  
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21

D-7000 Stuttgart 30

This instruction remains valid until further notice.

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**L5**

Technical Bulletin

Alfa Romeo



# After-sales Service

## Technical Bulletin

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### NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDI-1-227/108 En

5.1981

The introduction of new ignition systems has made it necessary to reclassify all designations. The designations listed below will be used immediately in KH workshops and in sales literature.

Designation	Abbreviated code	Meaning	Switching part	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-----	mechanical (breaker points)	mechanical (ignition distributor)	mechanical (ignition distributor)
Transistorized coil ignition	TSZ-k (TCI-c)	k=breaker-triggered	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)
Trigger box with traditional switching techniques	TSZ-I* (TCI-i)	I=induction type pulse generator	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)
	TSZ-H (TCI-h)	H=Hall generator	electronic (trigger box)	mechanical ignition distributor	mechanical (ignition distributor)
Transistorized ignition (Trigger box in hybrid technique)	TZ-I* (TI-i)	I=induction type pulse generator	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)
	TZ-H* (TI-h)	H=Hall generator	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)

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Technical Bulletin

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Designation	Abbreviated code	Meaning	Switching part	Ignition control and spark advance	High-voltage distribution
Electronic ignition	EZ-L	L=characteristic curve	electronic (trigger box or control unit)	electronic (control unit)	mechanical (ignition distributor)
	EZ-F	F=ignition map	electronic (trigger box or control unit)	electronic (control unit)	mechanical (high-voltage distributor)
Distributorless semiconductor ignition	VZ-L	L=characteristic curve	electronic (control unit)	electronic (control unit)	electronic (two-spark ignition coil, or 1 ignition coil/spark plug)
	VZ-F	F=ignition map	electronic (control unit)	electronic (control unit)	electronic (two-spark ignition coil, or 1 ignition coil/spark plug)

\* Please note: The ignition system can additionally be fitted with a DLS unit (digital idle stabilizer) or with an ELS unit (electronic idle stabilizer) or with an ESV unit (electronic ignition retardation).



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

INCORRECT DISPLAY OF ROTATIONAL SPEED AND  
DWELL ANGLE ONLY WITH TRIGGER BOXES  
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT  
LIMITATION

VDT-I-Gen. 030 En  
6.80  
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00}	Rotational-speed	KTE 001.00
001.01}	display O.K. with these	001.02
001.02	testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild-ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General-Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

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**L8**

Motor Vehicle Service Information

Alfa Romeo



## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm

or

1 ballast resistor 1.0 Ohm

2 blade receptacles e.g.

approx. 0.2 m cable, 1.5 mm<sup>2</sup> e.g.

2 insulated clips

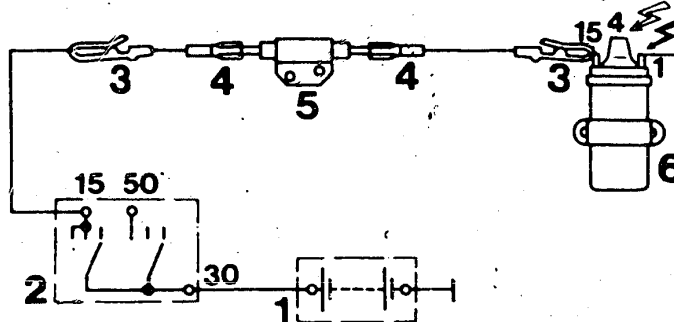
Part No. 0 227 900 002

Part No. 0 227 900 101

Part No. 1 901 355 881

Part No. 6 210 150 150

Commercially available



1 = Battery

2 = Ignition switch

3 = Clips

4 = Blade receptacle

5 = Ballast resistor

6 = Ignition coil

⚡ approx. 400 V

⚡ approx. 25 kV

### 2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

### 2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.

# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

### MOTORTESTER CONVERSION

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes  
0 227 100 ... (TCI-i, TCI-h) with current  
limitation

VDI-I-Gen. 032 En  
6.80

For additional information see VDI-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268  
268 S 10  
269  
214 B  
AE 2000

#### 1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

#### 2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

#### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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Motor Vehicle Service Information

Alfa Romeo





#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.





# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

TESTS ON ELECTRONIC IGNITION SYSTEMS  
(TCI, TZ)  
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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Motor Vehicle Service Information

Alfa Romeo



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Automotive Equipment - After-Sales Service  
Department for Technical Publications KH/VDT,  
Postfach 50, D-7000 Stuttgart 1.

Published by: After-Sales Service Department for  
Training and Technology (KH/VSK). Press Date: 3.1983.  
Please direct questions and comments concerning the  
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photographié en République Fédérale d'Allemagne.

